INSTALLATION RESTORATION PROGRAM

SURVEILLANCE AND OVERSIGHT OF REMEDIAL ACTIONS AT SITE 2 AND SITE 4

FINAL

COMPLETION REPORT

MICHIGAN AIR NATIONAL GUARD
ALPENA COMBAT READINESS TRAINING CENTER

February 1996

Prepared For:

Air National Guard
Andrews AFB, Maryland

Prepared By:

Montgomery Watson
Novi, Michigan

MONTGOMERY WATSON

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Surveillance and Oversight of Remedial Actions at Site 2 and Site 4 Completion Report for Alpena Combat Readiness Training Center, Alpena, MI. This report documents remediation activities through completion at Site 2 and Site 4 at Alpena CRTC. Contaminated soils were remediated from May 1995 through August 1995 using a combination of stabilization, in-situ bioremediation, and ex-situ bioremediation techologies.

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ACRONYM LIST

CRTC	Combat Readiness Training Center
EPA	United States Environmental Protection Agency
kg	kilogram
l	liter
MDNR	Michigan Department of Natural Resources
mg	milligram
ppm	parts per million
RFTP	Request for Technical Proposal
SAP	Sampling and Analysis Plan
SPLP	Synthetic Precipitation Leaching Procedure
SVOC	Semi-Volatile Organic Compound
TCLP	Toxicity Characteristics Leaching Procedure
TPH	Total Petroleum Hydrocarbon
ug	microgram
USPFO	United States Property and Fiscal Officer
VOC	Volatile Organic Compound

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EXECUTIVE SUMMARY

This report documents remediation activities through completion at Site 2 and Site 4 of the Alpena Combat Readiness Training Center (CRTC) in Alpena, Michigan. Remediation activities included:

Site 2

- In-situ bioremediation of total petroleum hydrocarbon (TPH) contaminated soil;
- Stabilization of lead contaminated soil; and
- Installation of storm sewer piping;

Site 4

- Ex-situ bioremediation of volatile organic compound (VOC) and semi-volatile organic compound (SVOC) contaminated soil;
- Removal and disposal of the concrete pad, fuel pipeline, and block pit; and
- Removal and disposal of construction debris from the gully.

Remediation activities were conducted and completed by Unico Construction Company of San Antonio, Texas. Montgomery Watson of Novi, Michigan provided surveillance and oversight services to the Air National Guard under contract DAHA-90-94-D0013, Delivery Order 4.

Based on the confirmatory sampling analytical results, the contaminated soils at Site 2 and Site 4 of the Alpena CRTC have been remediated in accordance with the United States Property and Fiscal Officer's Request for Technical proposal. No further action is required at Site 2 and Site 4 with respect to the Installation Restoration Program.

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1.0 INTRODUCTION

This report documents remediation activities through completion at Site 2 and Site 4 of the Alpena Combat Readiness Training Center (CRTC) in Alpena, Michigan (Figure 1). Contaminated soils were remediated from May 1995 through August 1995 using a combination of stabilization, in-situ bioremediation, and ex-situ bioremediation technologies. Remediation activities were completed by Unico Construction Co., Inc. (the general contractor) and CCC Group, Inc. (a subcontractor) both of San Antonio, Texas. Remediation activities included:

Site 2

- In-situ bioremediation of total petroleum hydrocarbon (TPH) contaminated soil;
- Stabilization of lead contaminated soil; and
- Installation of storm sewer piping;

Site 4

- Ex-situ bioremediation of volatile organic compound (VOC) and semi-volatile organic compound (SVOC) contaminated soil;
- Removal and disposal of the concrete pad, fuel pipeline, and block pit; and
- Removal and disposal of construction debris from the gully.

Montgomery Watson of Novi, Michigan provided surveillance and oversight services to the Air National Guard under contract DAHA-90-94-D0013, Delivery Order 4. Montgomery Watson's activities included:

- On-site surveillance and oversight for the first 30 days of remediation activities;

- Weekly on-site inspections following the initial 30-day period;

- Attendance at the Pre-Bid, Pre-Construction, and Final Inspection meetings. Provided technical minutes for each of these meetings;

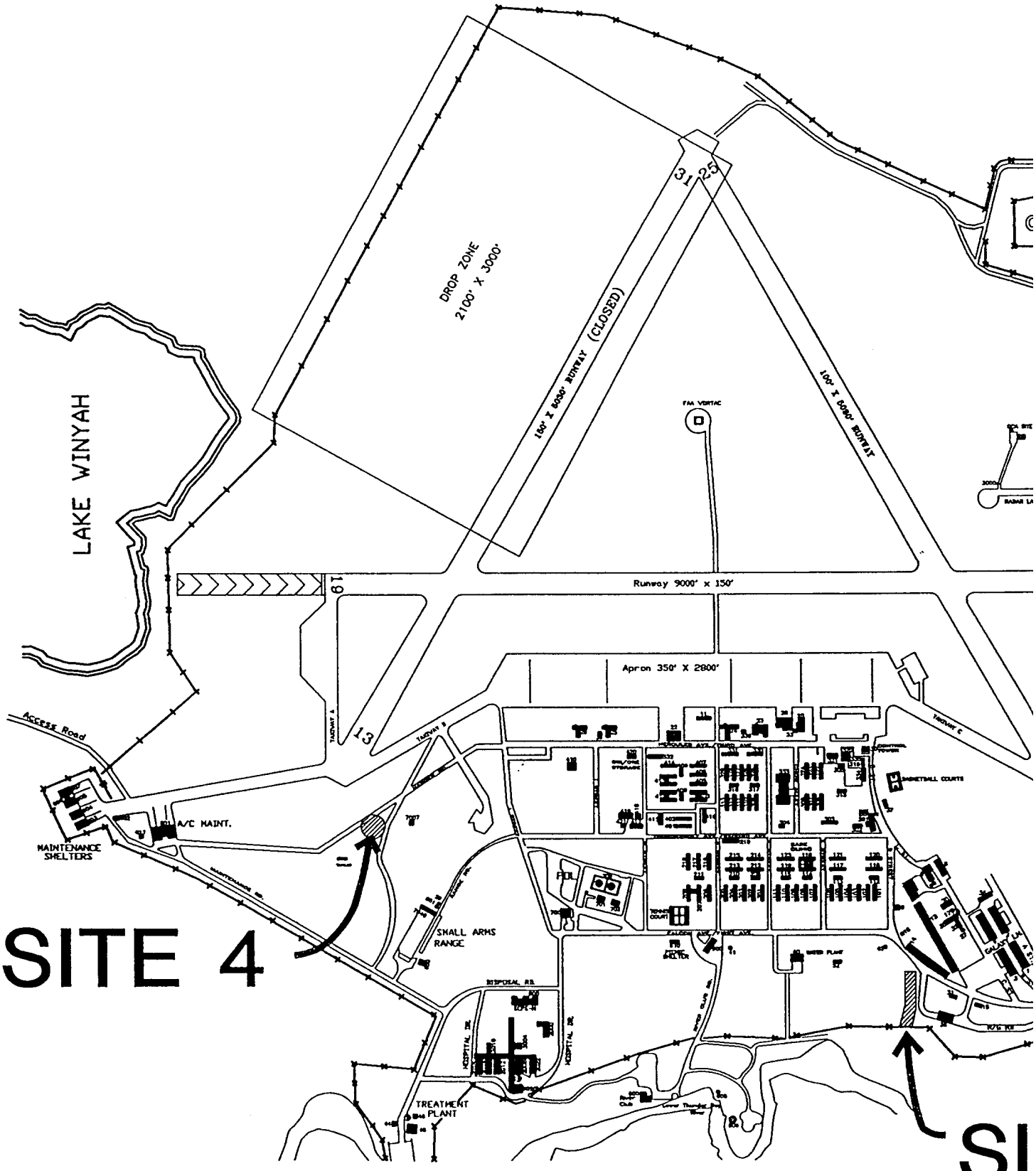
- Assistance to Air National Guard personnel during review of technical proposals;

- Review of contractor submittals; and

- On-going routine technical assistance to Air National Guard personnel.

The remainder of this report includes the following:

- A brief history of the remediation project;
- Details of the remediation activities;
- A discussion of sampling activities and analytical results; and
- Conclusions drawn from the analytical results.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DROP ZONE
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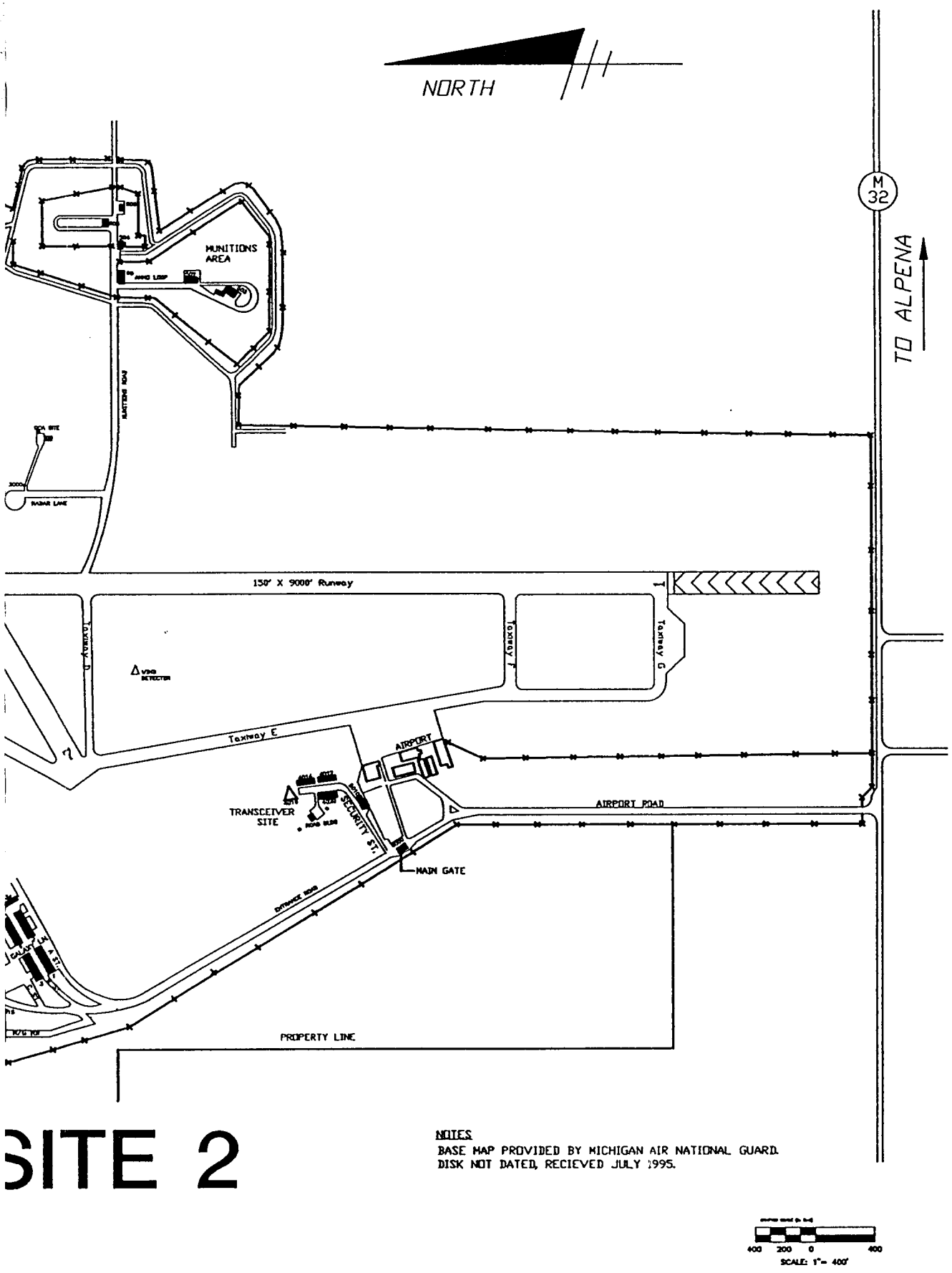
150' X 8000' RUNWAY (CLOSED)
100' X 8000' RUNWAY
31
25
19
13
Runway 9000' x 150'
Apron 350' X 2800'
Access Road
A/C MAINT.
MAINTENANCE SHELTERS
SMALL ARMS RANGE
POOL
BASKETBALL COURTS
TREATMENT PLANT
SITE 4
= REMEDIATION AREAS



SITE 2

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MONTGOMERY WATSON

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FIGURE 1

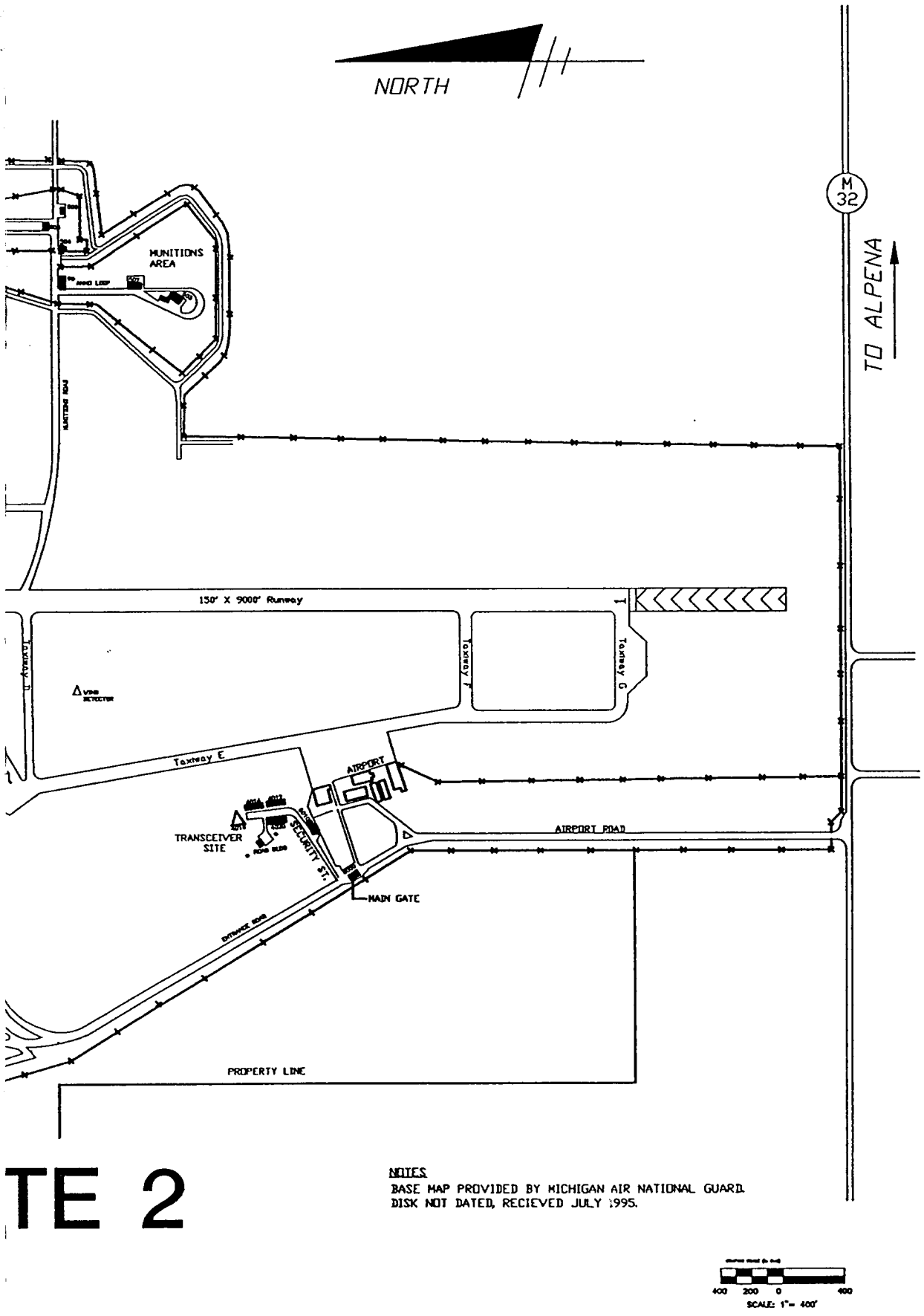

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FIGURE 1

2.0 BACKGROUND

In December 1994, the United States Property and Fiscal Officer (USPFO) for Michigan issued a Request for Technical Proposal (RFTP) to construct a bioremediation system (in-situ or ex-situ) to address contaminated soils at Site 2 and Site 4 of the Alpena CRTC in Alpena, Michigan (RFTP included as Appendix A). As outlined in the RFTP, proposed remediation systems for Site 2 were required to address approximately 111 cubic yards of TPH contaminated soil and 319 cubic yards of lead contaminated soil. Proposed remediation systems for Site 4 were required to address approximately 18,235 cubic yards of VOC and SVOC contaminated soil. Additional background information on Site 2 and Site 4 can be found in the RFTP and the *Source Removal Action Plan* (The Earth Technology Corporation, June 1994).

A Pre-Bid meeting was held with potential bidders on January 9, 1995. Technical proposals were submitted to the USPFO by February 22, 1995. Technical proposals were reviewed by Air National Guard and Montgomery Watson personnel during the week of February 27, 1995. Following the technical review, qualified contractors were asked to submit a bid to the USPFO. Based on their technical proposal and bid, Unico Construction Co., Inc. (Unico) was selected as the remediation contractor.

A Pre-Construction meeting was held with representatives from the USPFO, the Michigan Air National Guard, the National Guard Bureau, Unico, CCC Group, and Montgomery Watson on April 11, 1995. Unico initiated remediation activities in May 1995. Remediation activities were completed in August 1995 with the Final Inspection meeting being held on August 14, 1995.

Technical minutes for the Pre-Bid, Pre-Construction, and Final Inspection meetings are provided as Appendix B.

3.0 REMEDIATION ACTIVITIES

Unico performed remediation activities at Site 2 and Site 4 in accordance with the RFTP (Appendix A) and their May 1995 *Bioremediation System Design* (Appendix C). Unico's remediation activities included:

Site 2

- In-situ bioremediation of TPH contaminated soil;
- Stabilization of lead contaminated soil; and
- Installation of storm sewer piping;

Site 4

- Ex-situ bioremediation of VOC and SVOC contaminated soil;
- Removal and disposal of the concrete pad, fuel pipeline, and block pit; and
- Removal and disposal of the construction debris from the gully.

Montgomery Watson provided on-site surveillance and oversight activities for the first 30 days of remediation activities and weekly inspections thereafter. Montgomery Watson's field notes and photographs documenting remediation activities have been included as Appendix D and Appendix E, respectively.

3.1 SITE 2

As outlined in the RFTP, soils at Site 2 exhibited elevated concentrations of TPH and lead. TPH concentrations varied from a low of 9.7 parts per million (ppm) to a high of 460 ppm. The TPH contaminated area was identified as 150 feet of drainage ditch west of the storm sewer discharge from vehicle maintenance (Figure 2). Lead concentrations ranged from a low of 0.85 ppm to a high of 48 ppm. The lead contaminated area was identified as 430 feet of drainage ditch west of the storm sewer discharge from vehicle maintenance (Figure 2).

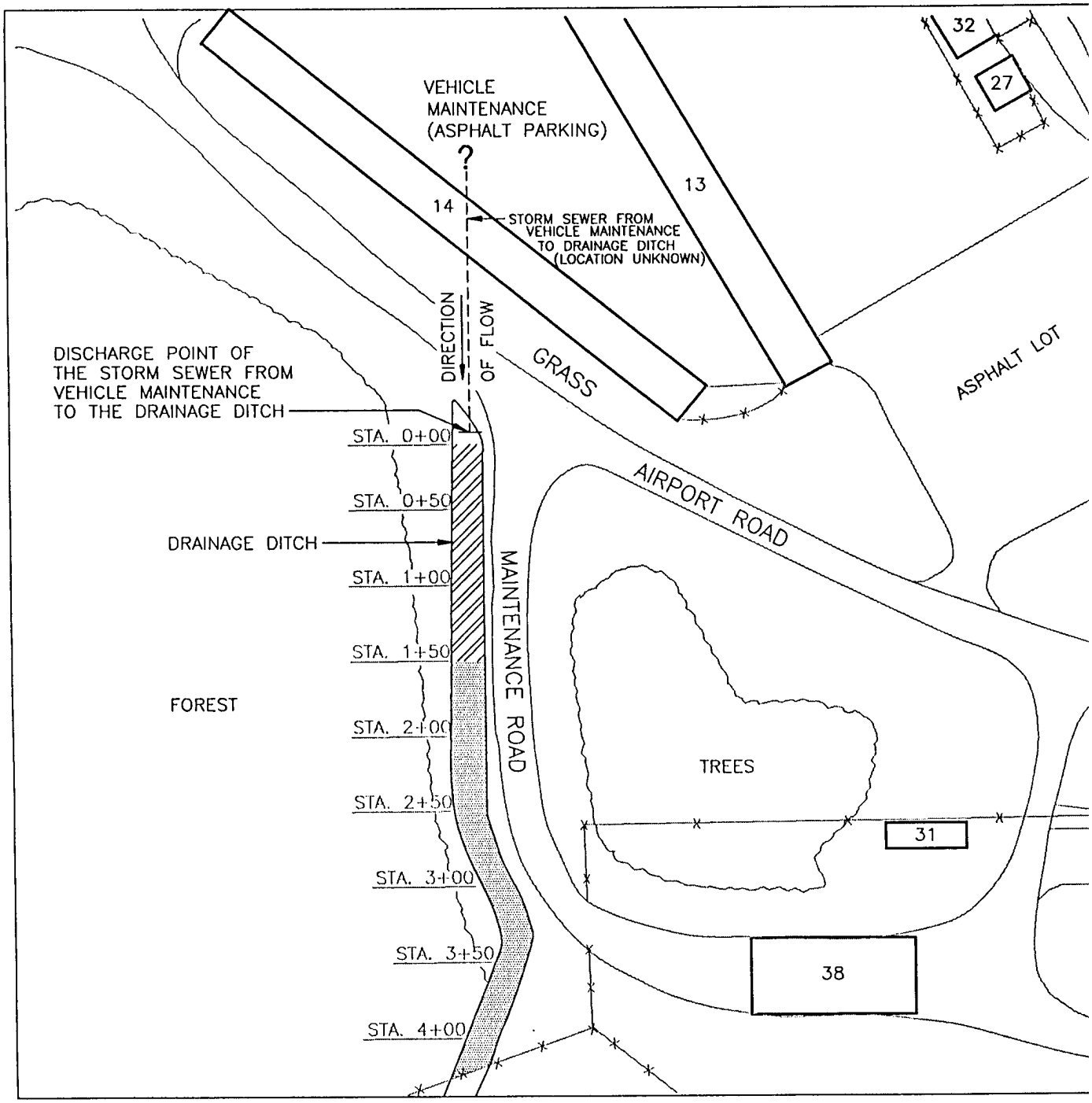
The vertical extent of the TPH and lead contamination was identified as one foot below ground surface. The drainage ditch was estimated to be approximately 20 feet wide.

3.1.1 In-Situ Bioremediation. The TPH contaminated soil was remediated using in-situ bioremediation as shown in Figure 3. The in-situ process began by using a Komatsu excavator to mechanically mix and expose the contaminated soil (i.e., the top 1 foot of soil). A bacteria/nutrient solution was then sprayed on to the soil. The bacteria used in this solution were specifically selected to remediate TPH contaminated soil by Micro-Tes, Inc. of San Antonio, Texas. The solution was prepared in a 500 gallon plastic tank by mixing prepackaged volumes of hydrocarbon metabolizing bacteria with bacteria nutrients and water. Approximately one gallon of bacteria/nutrient solution was applied to each cubic yard of contaminated soil.

Following application of the bacteria/nutrient solution, the soil remained undisturbed for a period of one week while undergoing bioremediation. Confirmatory samples were then collected as detailed in Section 4. Approximately 111 cubic yards of TPH contaminated soil were remediated using in-situ bioremediation.

3.1.2 Stabilization. The lead contaminated soil was remediated using stabilization as shown in Figure 4. Similar to the bioremediation process, the Komatsu excavator was used to mechanically mix and expose the contaminated soil. Portland cement was then mixed with the soil using a walk-behind rototiller. Approximately six cubic yards of Portland cement was mixed with the contaminated soil. Water was added to the soil/cement mixture. Confirmatory samples were collected as detailed in Section 4. Approximately 319 cubic yards of contaminated soil were stabilized using Portland cement.

3.1.3 Storm Sewer Piping. Following treatment of the TPH and lead contaminated soil, approximately 430 feet of new storm sewer piping was installed at Site 2. The new piping began at the terminus of the storm sewer piping from vehicle maintenance and extended to approximately five feet beyond the fence line at the western end of the drainage ditch



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- - - - - -	STORM SEWER
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	AREA TREATED BY LEAD STABILIZATION

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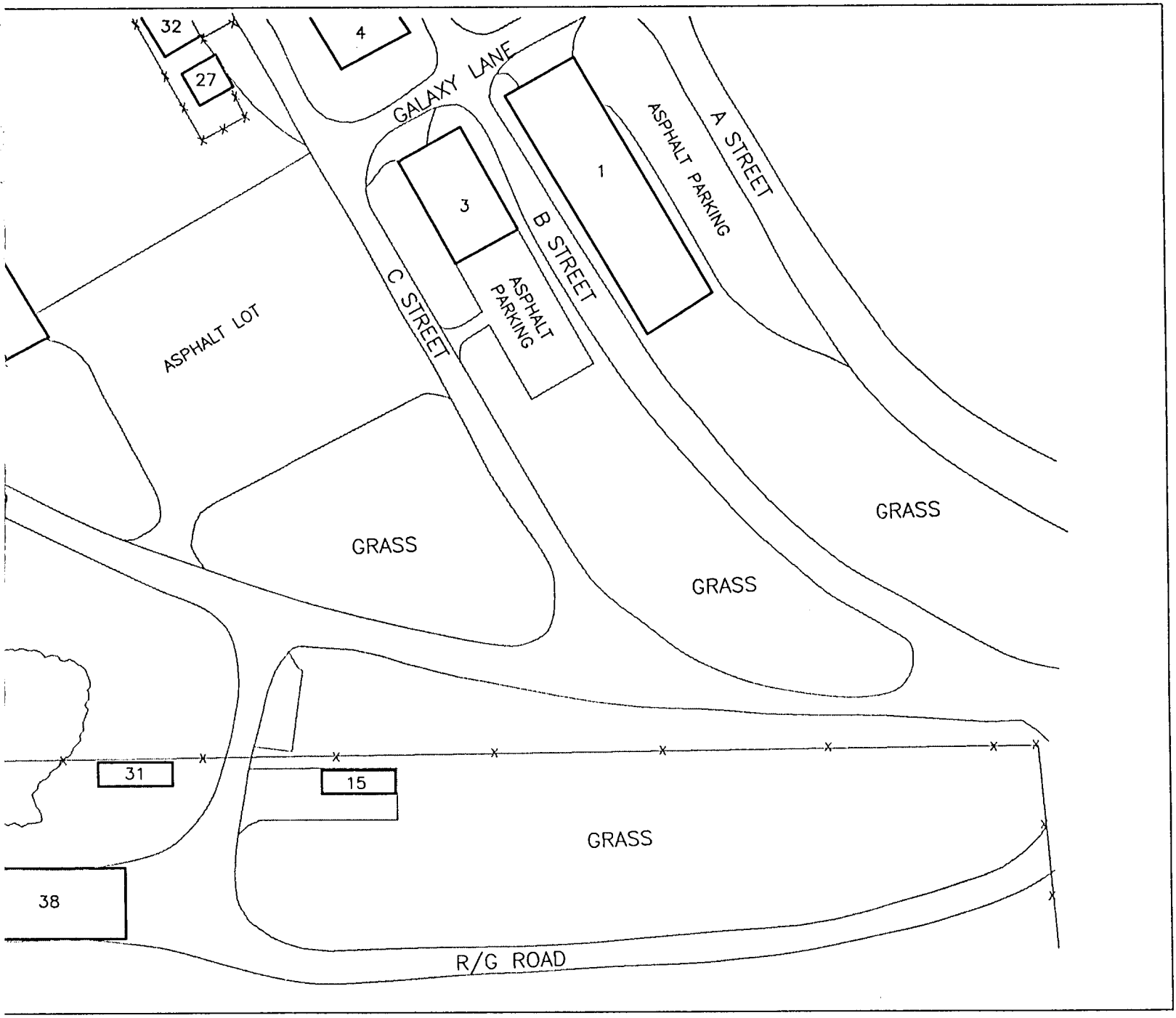

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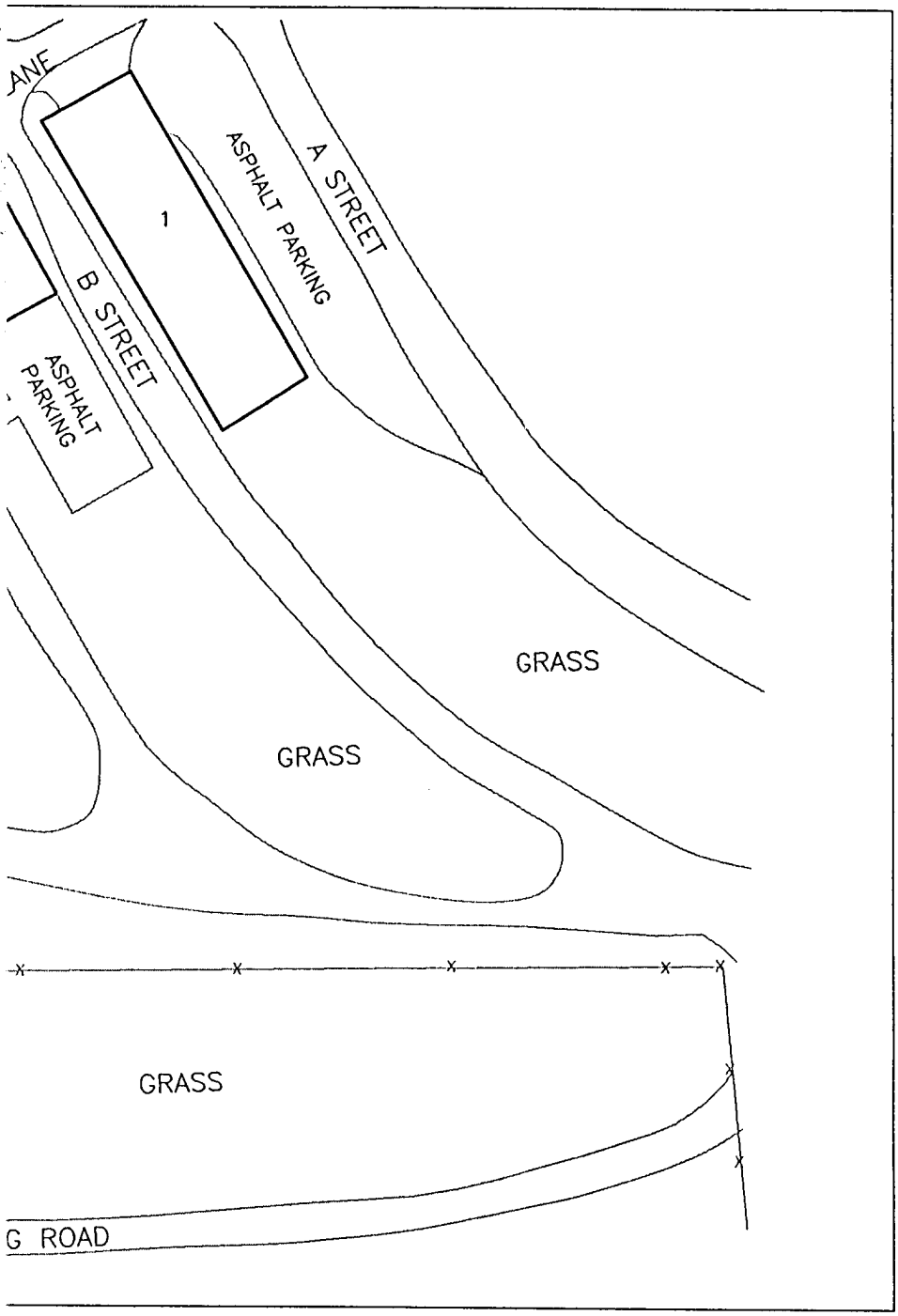

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north

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FIGURE 2

SITE 2 - AREAS OF REMEDIATION

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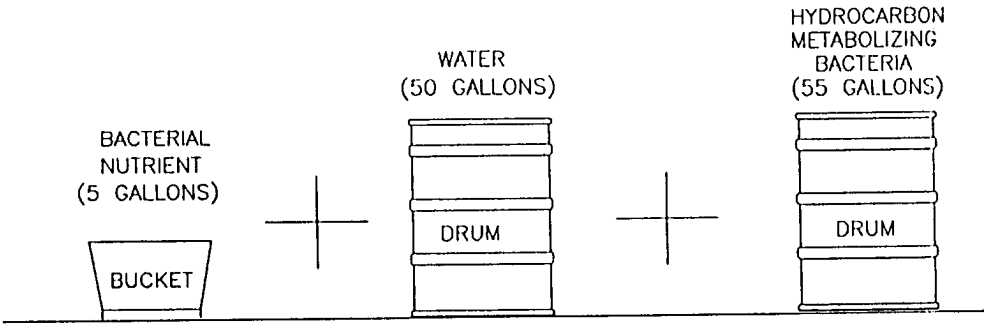

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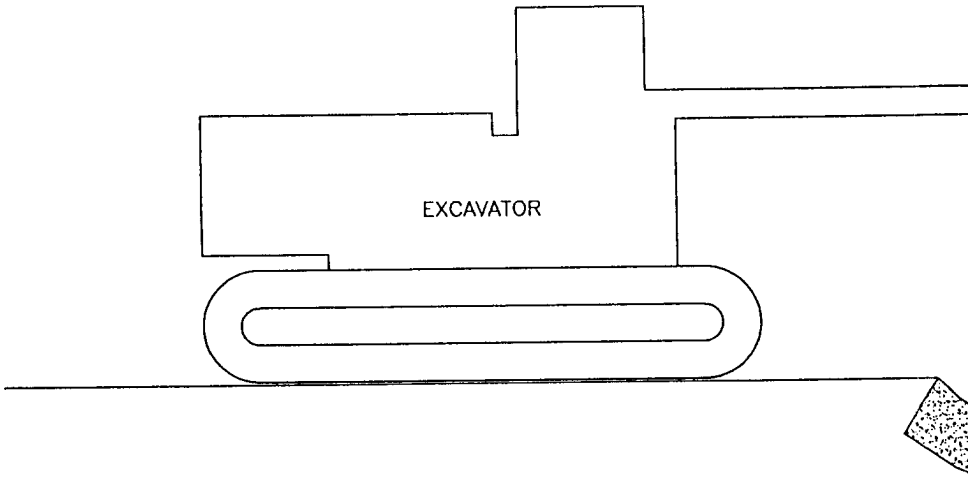
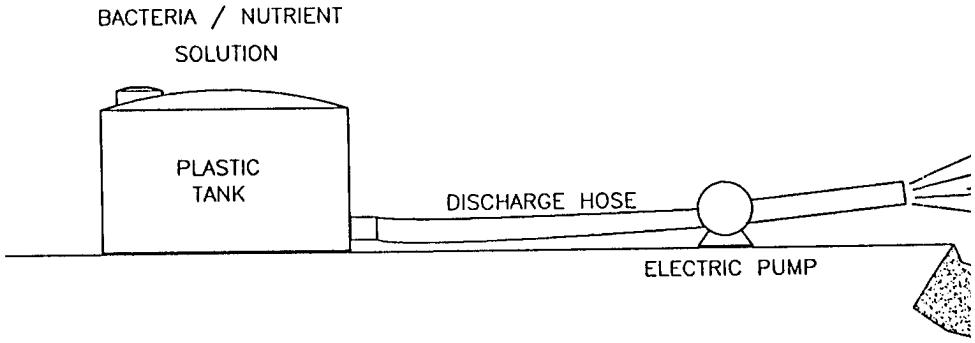


STEP 3



SEQUENCE OF OPERATIONS

STEP 1

5 GALLONS OF BACTERIAL NUTRIENT WAS ADDED TO 50 GALLONS OF WATER. THIS MIXTURE WAS THEN ADDED TO 55 GALLONS OF LFS-1 HYDROCARBON METABOLIZING BACTERIA TO FORM THE BACTERIA/ NUTRIENT SOLUTION. BOTH THE BACTERIAL NUTRIENT AND THE HYDROCARBON METABOLIZING BACTERIA WERE SUPPLIED BY:

MICRO-TES
12500 NETWORK, SUITE 201
SAN ANTONIO, TEXAS 78249
(201) 558-4751

STEP 2

A KOMATSU PC300LC EXCAVATOR WAS USED TO MECHANICALLY MIX THE CONTAMINATED SOIL (i.e., THE TOP 1 FOOT OF SOIL). MIXING THE SOIL FACILITATED APPLICATION OF THE BACTERIA/NUTRIENT SOLUTION TO THE CONTAMINATED AREAS.

STEP

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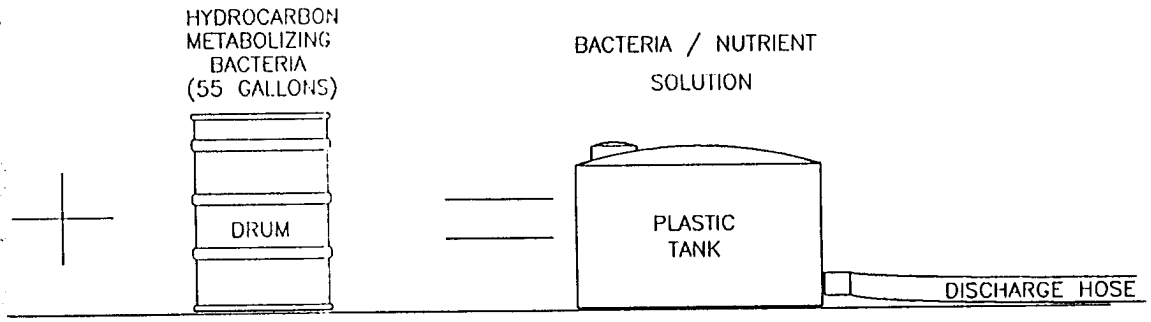

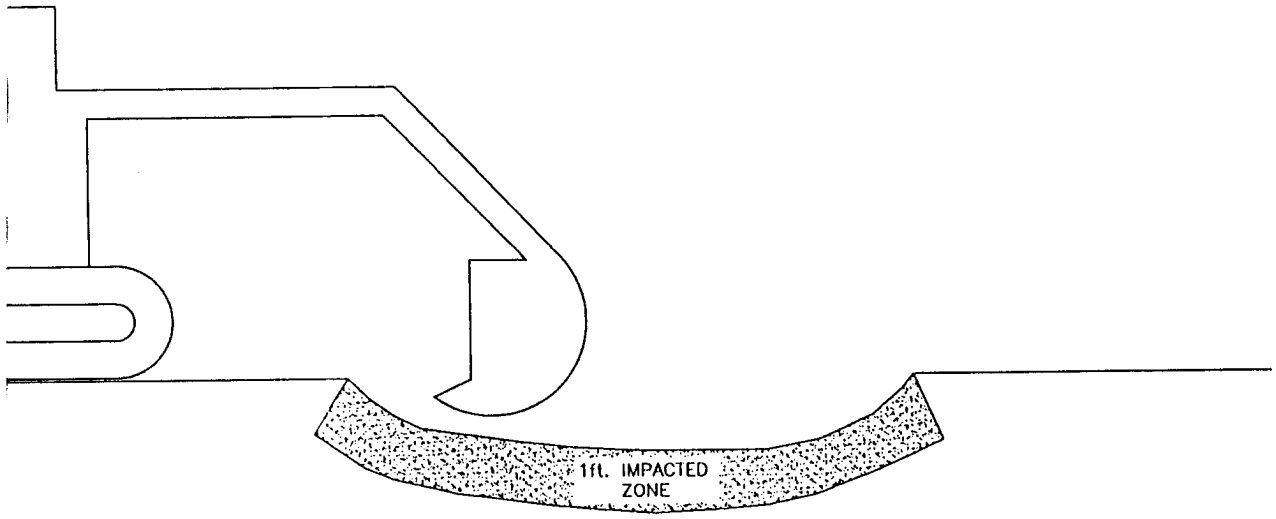

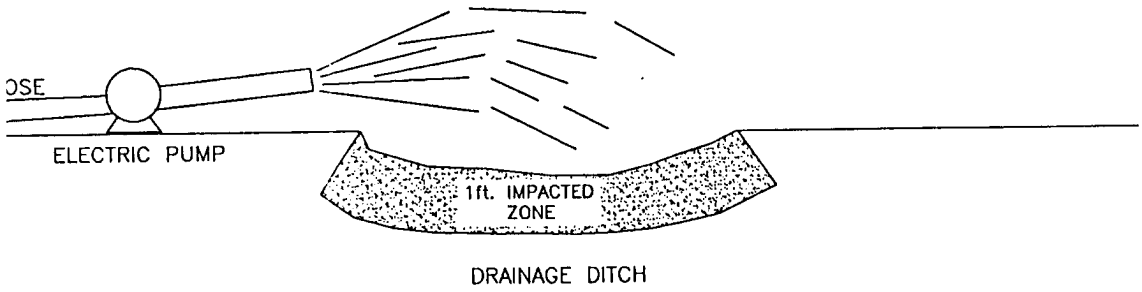

AS USED TO
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RIENT SOLUTION

STEP 3

A SMALL PUMP WAS USED TO SPRAY THE BACTERIA/NUTRIENT SOLUTION ACROSS THE CONTAMINATED SOIL. THE CONTAMINATED SOIL REMAINED IN PLACE DURING BIOREMEDIATION.

STEP 4

FOLLOWING BIOREMEDIATION, CONFIRMATORY SAMPLES WE COLLECTED EVERY 25 FT. FOR ANALYSIS OF SVOCs. SAMPLING LOCATIONS ARE SHOWN IN FIGURE 10.

NOT TO SCALE

FIGURE

:MEDIATION, CONFIRMATORY SAMPLES WERE
' 25 FT. FOR ANALYSIS OF SVOCs.
ONS ARE SHOWN IN FIGURE 10.

NOT TO SCALE

(3)

FIGURE 3

SITE 2 - REMEDIATION FLOW DIAGRAM - IN-SITU BIOREMEDIATION

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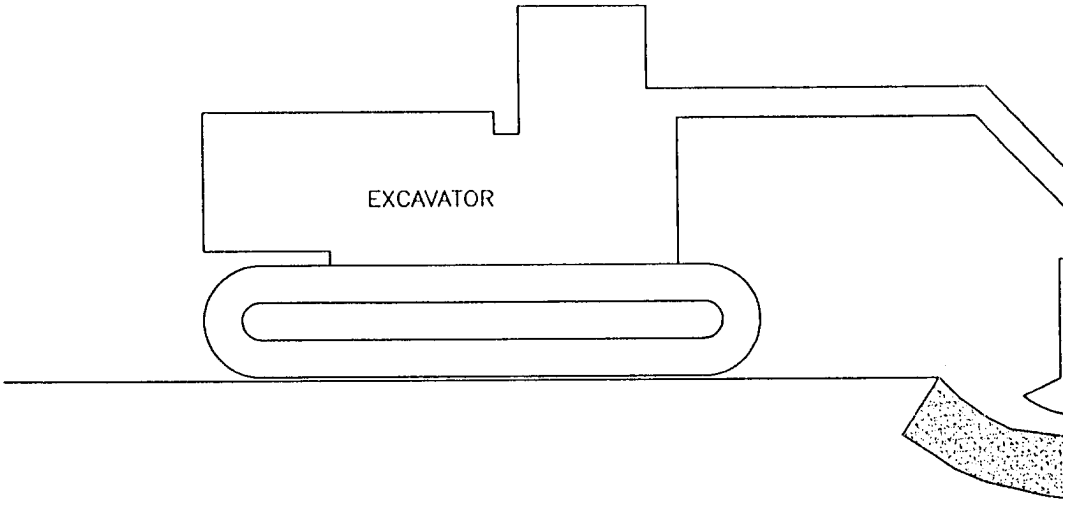
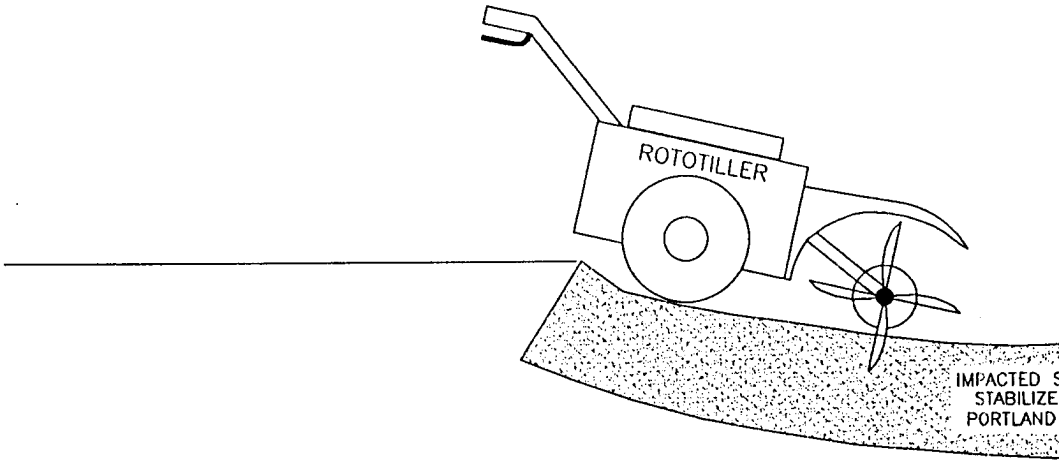


STEP 2



DRAINAG

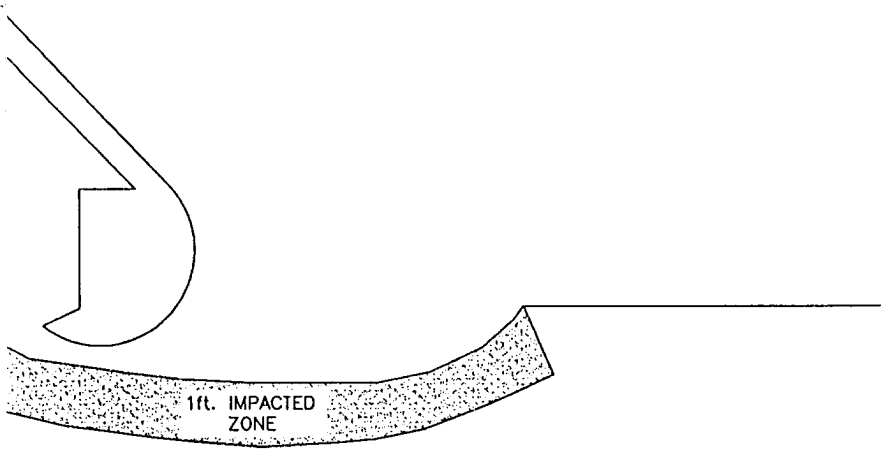
SEQUENCE OF OPERATIONS

STEP 1

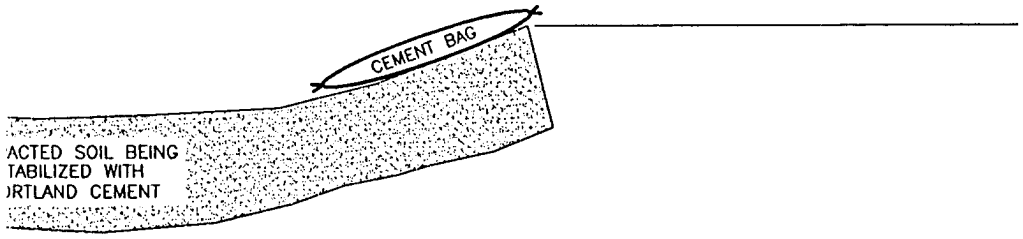
A KOMATSU PC300LC EXCAVATOR WAS USED TO MECHANICALLY MIX THE CONTAMINATED SOIL (i.e., THE TOP 1 FOOT OF SOIL). MIXING THE SOIL FACILITATES THE STABILIZATION PROCESS. ONCE THE SOIL WAS MIXED, BAGS OF DRY CEMENT WERE CUT OPEN AND SPREAD OUT ACROSS THE AREA TO BE STABILIZED. APPROXIMATELY 2% (BY VOLUME) PORTLAND CEMENT WAS ADDED TO CONTAMINATED SOIL.

STEP 2

A ROTOTILLER WAS USED TO MIX THE DRY CE
INTO THE CONTAMINATED SOIL. THE DRY CEM
CONTAMINATED SOIL TO FORM A MORE CHEMIC
THEREBY REDUCING THE POTENTIAL FOR LEAD
THE CONTAMINATED SOIL INTO THE GROUNDWA



DRAINAGE DITCH



RAINAGE DITCH

RY CEMENT
Y CEMENT ACTED WITH THE
CHEMICALLY STABLE FORM,
LEAD TO LEACH FROM
INDWATER.

STEP 3

FOLLOWING STABILIZATION, CONFIRMATORY SAMPLES WERE COLLECTED FOR ANALYSIS OF TCLP LEAD. SAMPLING LOCATIONS ARE SHOWN IN FIGURE 10.

NOT TO SCALE

FIGURE 4

SITE 2 - REMEDIATION FLOW DIAGRAM - STABILIZATION

COMPLETION REPORT
ALPENA COMBAT READINESS TRAINING CENTER
ALPENA, MICHIGAN

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Drawing Number
4

MONTGOMERY WATSON

(Figure 5). New storm sewer piping was 10-inch diameter, reinforced concrete pipe with bell and spigot joints. A gate valve was installed near the connection of the old piping to the new piping. It is anticipated that this gate valve will allow base personnel to prohibit drainage through the piping in the event of a controlled substance spill in the vehicle maintenance area. Following installation of the piping, approximately two feet of sand backfill material was placed above the storm sewer. All disturbed areas were finished with topsoil and grass seed.

3.2 SITE 4

As outlined in the RFTP, soils at Site 4 exhibited elevated concentrations of VOCs and SVOCs in the area beneath the concrete pad (former fire training area) (Figure 6). Site 4 soils also exhibited elevated TPH concentrations in the area surrounding the fuel pipeline. Specifically, the soils exhibited elevated concentrations of benzene (up to 300 ug/kg), naphthalene (up to 11,000 ug/kg), 2-methylnaphthalene (up to 26,000 ug/kg), and TPH (up to 9,160 ppm). The VOC and SVOC contaminated area was identified as the area beneath the concrete pad to a depth of 26 feet. The TPH contaminated area was identified as the area surrounding the fuel pipeline measuring five feet wide by 20 feet deep. Although it was not known to exhibit elevated concentrations of VOCs, SVOCs, or TPH, the top two feet of the gully was addressed as a precautionary measure (the gully receives surface water runoff from the contaminated areas). The gully was estimated to be 80 feet long by 20 feet wide.

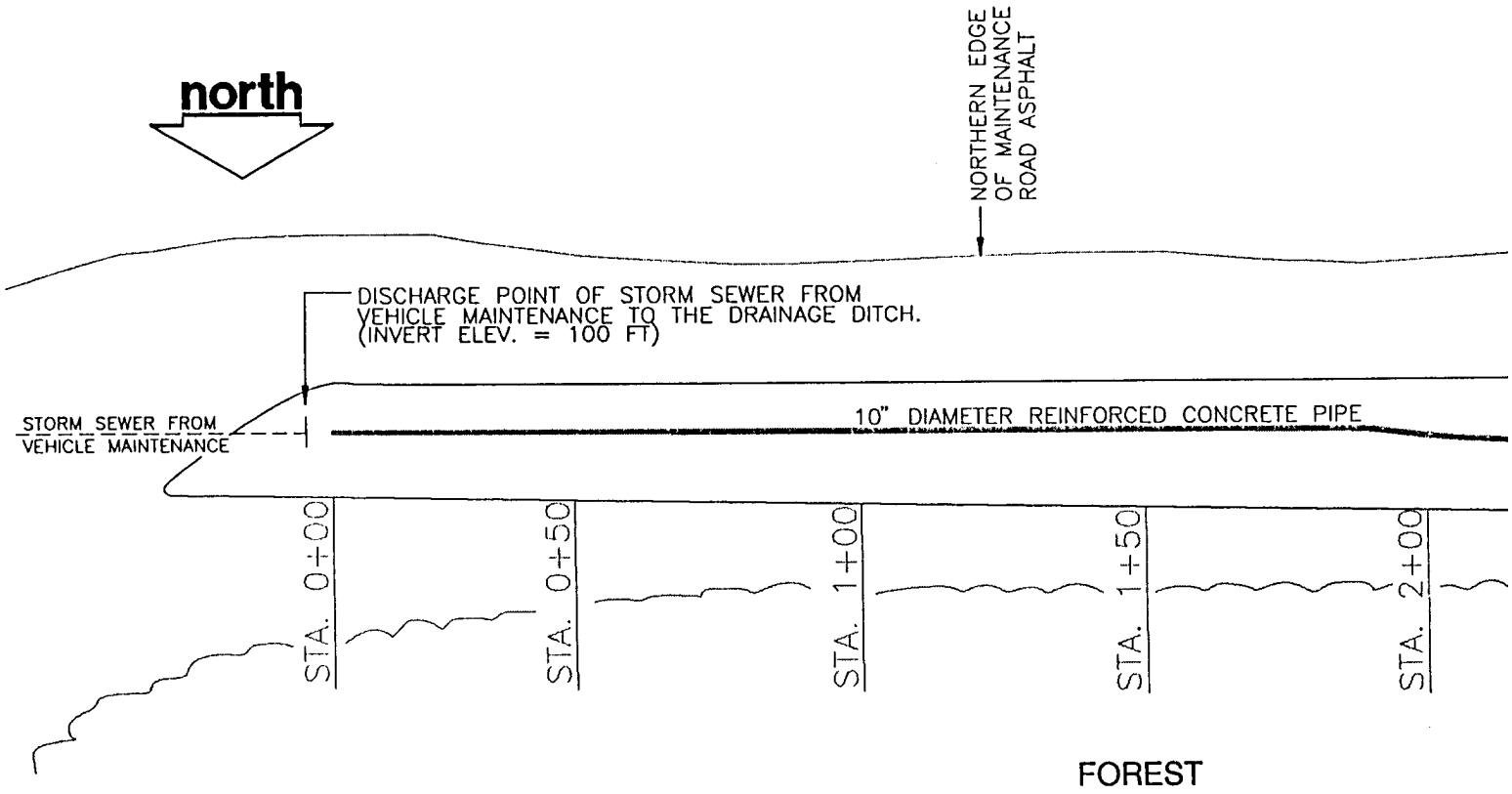
3.2.1 Ex-situ Bioremediation. The VOC, SVOC, and TPH contaminated soils at Site 4 were remediated using ex-situ bioremediation as shown in Figure 7. The ex-situ process began by using a Komatsu excavator to remove soil from the contaminated areas. The contaminated soil was then fed into the Royer Shredder (shredder) located adjacent to the excavation. Inside the shredder the contaminated soil was broken into very small particles such that the resulting soil was more homogeneous and richer in oxygen. As the contaminated soil was discharged from the shredder, the soil was inoculated with the bacteria/nutrient solution (the same solution used at Site 2). A pump located on the

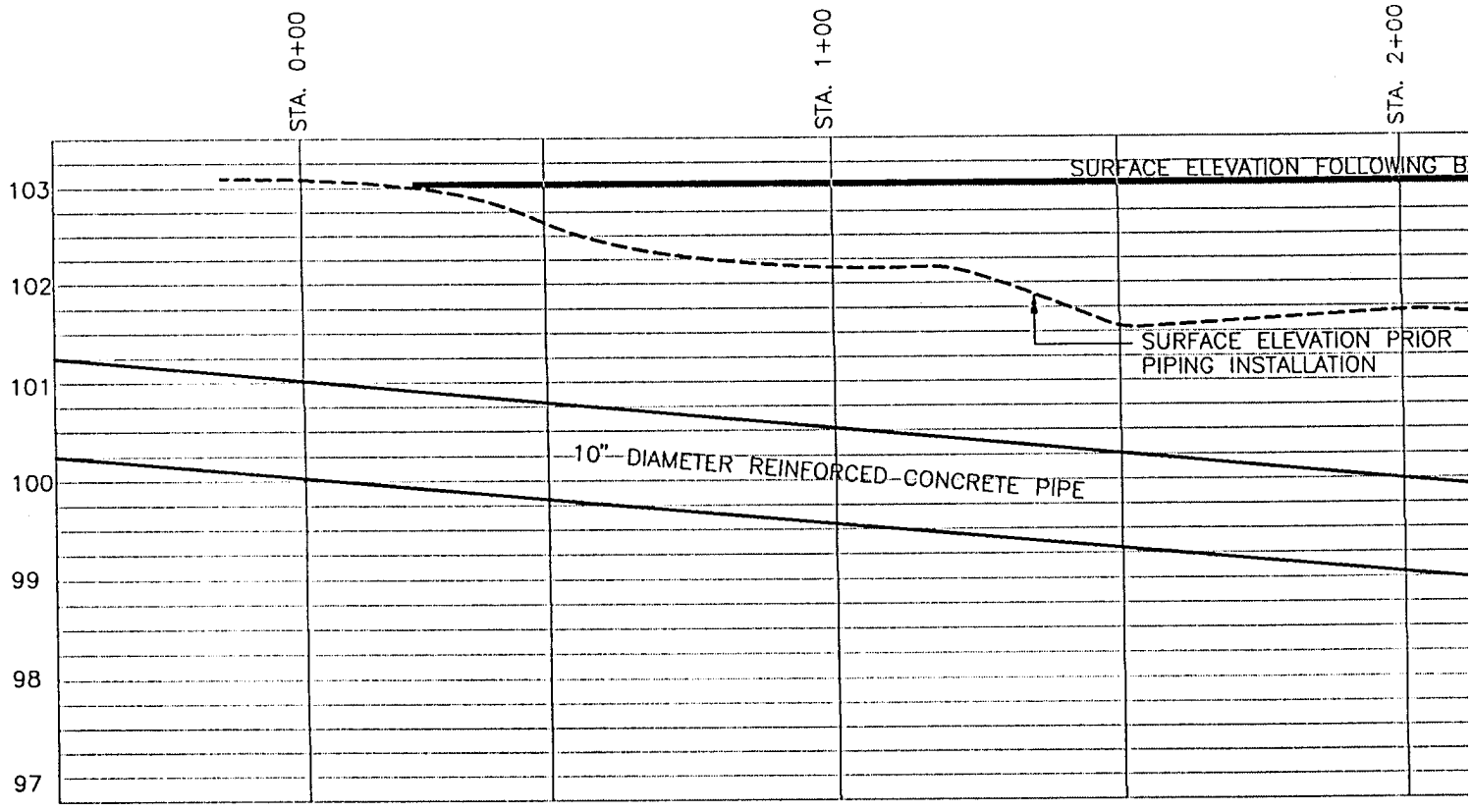
shredder drew the solution from a nearby plastic storage tank and discharged the solution through spray bars onto the soil. The shredder operator controlled the flow rate of the bacteria/nutrient solution. Approximately 1 gallon of solution was added to each cubic yard of contaminated soil.

Soil inoculated with the bacteria/nutrient solution was discharged from the shredder and picked up by one of two front end loaders. The two front end loaders transported the inoculated soil from the shredder to the appropriate biocell located in the vacant field north of the excavations (Figure 8). Each biocell was constructed with a 30 millimeter, high density polyethylene liner measuring approximately 200 feet long by 50 feet wide. The biocells were constructed, as necessary, by laying the liner flat on the ground and constructing a small berm (i.e., less than two feet high) around three of the four sides. The fourth side was left open as an entrance/exit for the front end loaders. After the biocell was full, a berm was built on the fourth and final side, such that this fourth side became a shared wall with the next biocell. Soil was placed in the biocells by the front end loaders in piles. A typical biocell held two windrows of soil with each windrow holding 10 to 15 piles of soil. A typical biocell held 1,000 to 1,500 cubic yards of soil.

The inoculated soil underwent bioremediation in the biocells for approximately three to four weeks prior to confirmatory sampling. Confirmatory samples were then collected as detailed in Section 4. Following confirmation that the contaminated soil had been remediated (i.e., receipt of analytical results), treated soil was placed back into the excavations as backfill material. All disturbed areas were finished with topsoil and grass seed. Approximately 13,000 cubic yards of soil were remediated using ex-situ bioremediation.

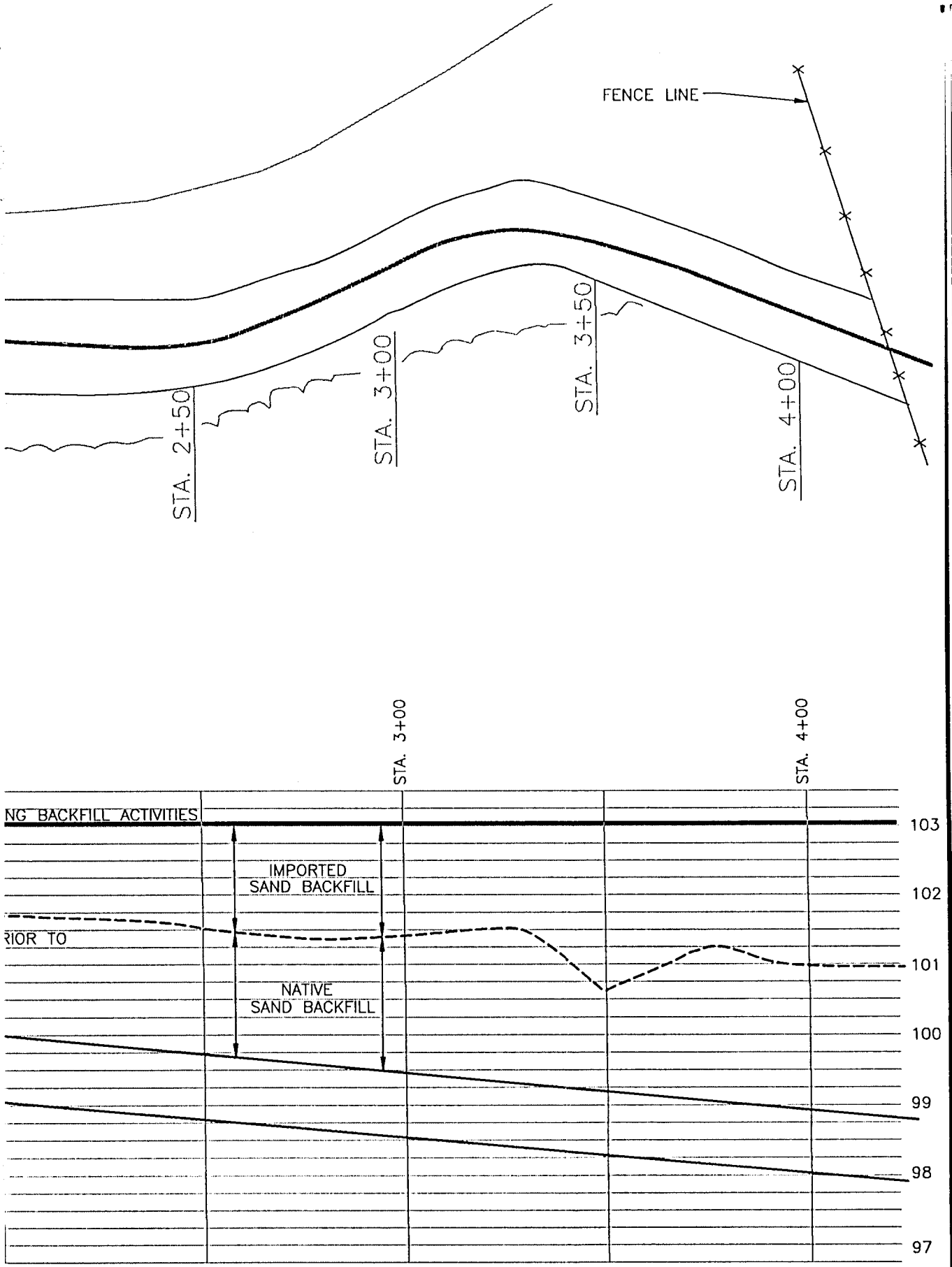
In the beginning of the bioremediation process at Site 4 (i.e., during construction of the first biocell), Unico experimented with positioning the shredder inside the biocell. Under this equipment configuration, the front end loaders were used to transport contaminated soil from the excavation to the shredder. Soil exiting the shredder discharged directly into the





NOTES:

1. ELEVATIONS OF FEATURES SHOWN ARE BASED ON ASSIGNING AN ELEVATION OF 100 ft. TO THE INVERT OF THE DISCHARGE POINT OF THE STORM SEWER FROM VEHICLE MAINTENANCE TO THE DRAINAGE DITCH. SURVEY INFORMATION TAKEN FROM UNICO'S FINAL REPORT FOR SITE 2 AND SITE 4 BIOREMEDIATION ACTIVITIES (UNICO, AUGUST 1995).



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SITE 2 - STORM PIPING - PLAN AND PROFILE

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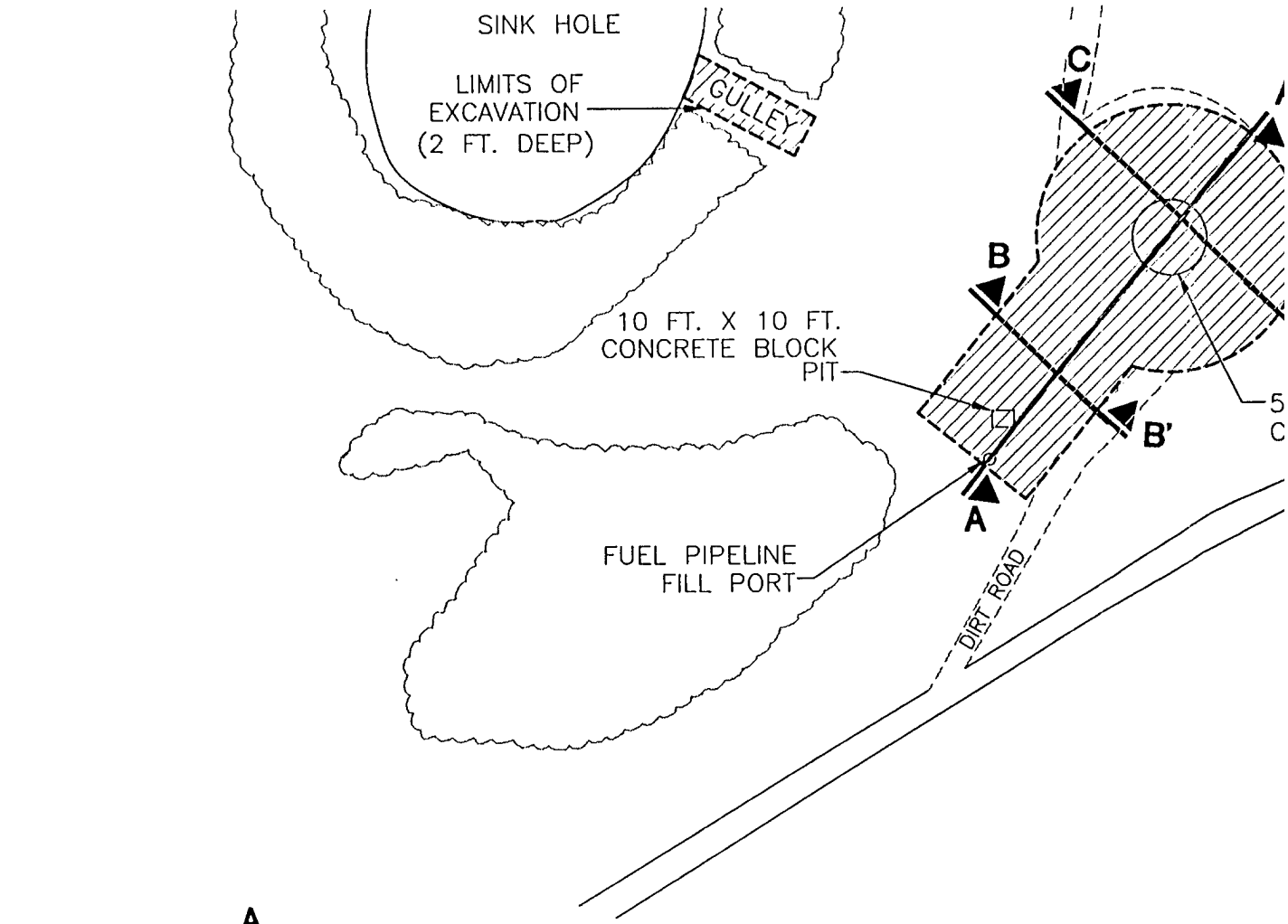
ALPENA COMBAT READINESS TRAINING CENTER
ALPENA, MICHIGAN

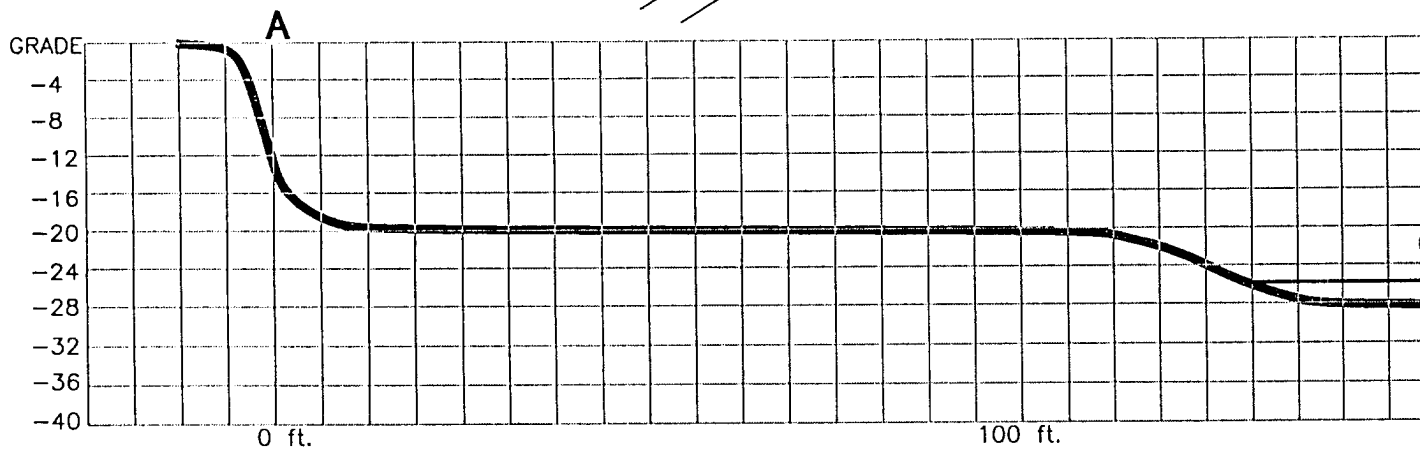
Drawing Number
7

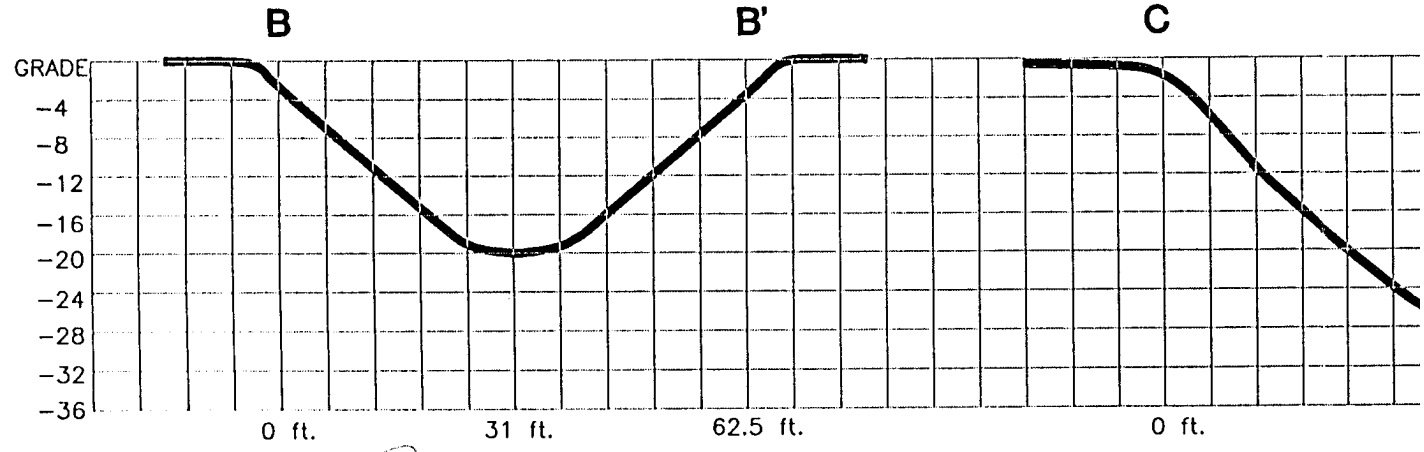
MONTGOMERY WATSON

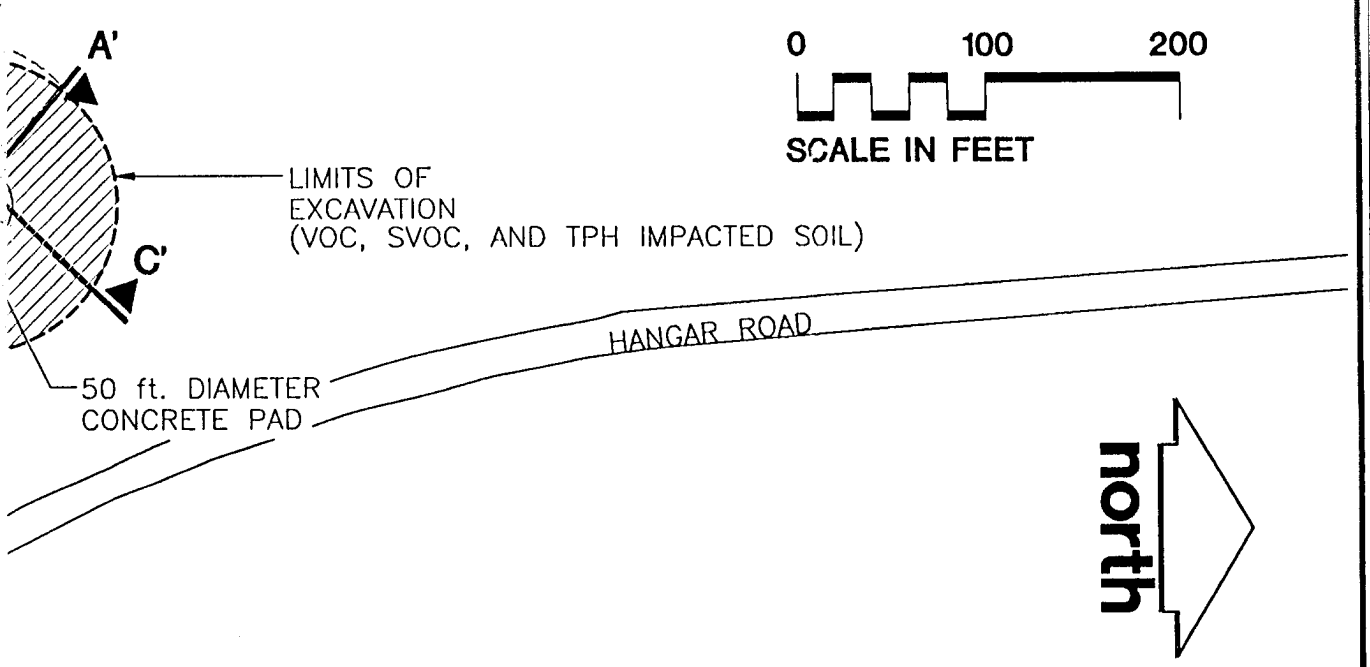
(2)

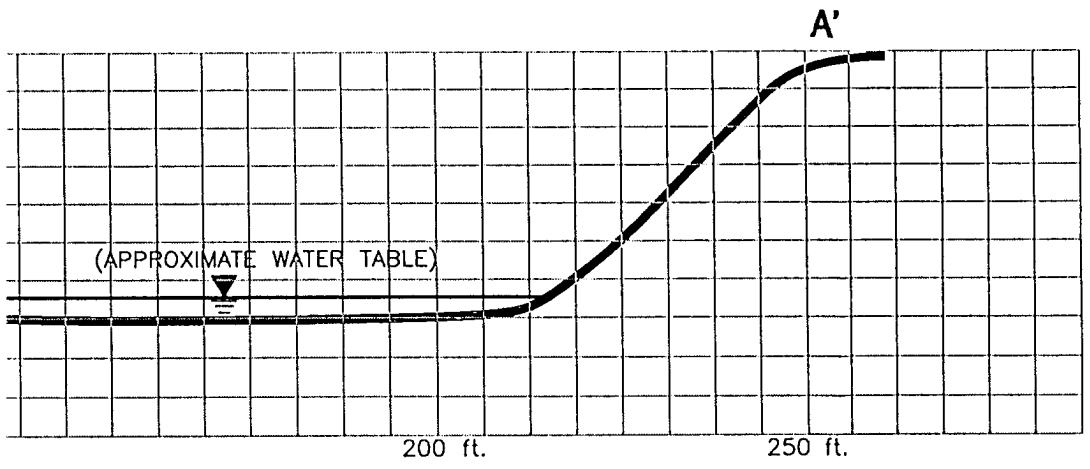
FIGURE 5

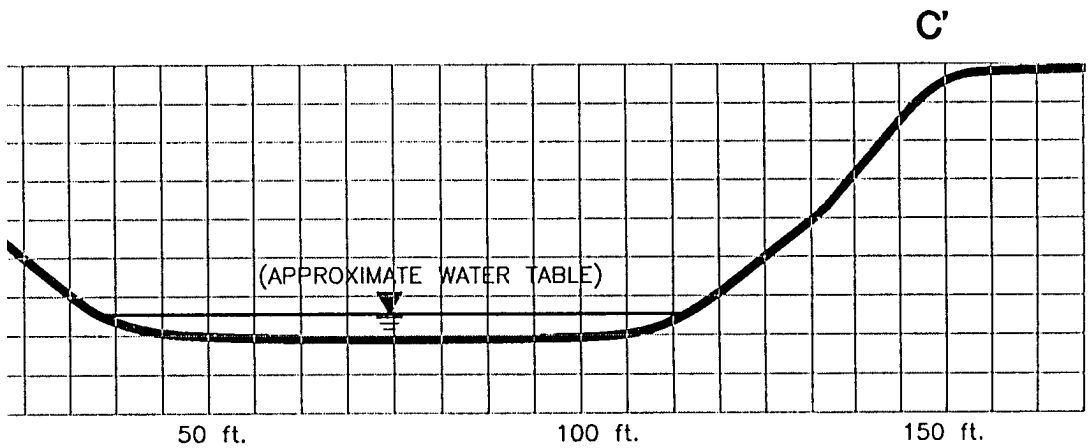

SINK HOLE
LIMITS OF EXCAVATION (2 FT. DEEP)
GULLEY
10 FT. X 10 FT. CONCRETE BLOCK PIT
FUEL PIPELINE FILL PORT
DIRT ROAD
A
B
B'
C


A
GRADE
-4
-8
-12
-16
-20
-24
-28
-32
-36
-40
0 ft.
100 ft.


B
B'
C
GRADE
-4
-8
-12
-16
-20
-24
-28
-32
-36
0 ft.
31 ft.
62.5 ft.
0 ft.







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SITE 4 - AREAS OF REMEDIATION

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ALPENA COMBAT READINESS TRAINING CENTER
ALPENA, MICHIGAN

Drawing Number
10

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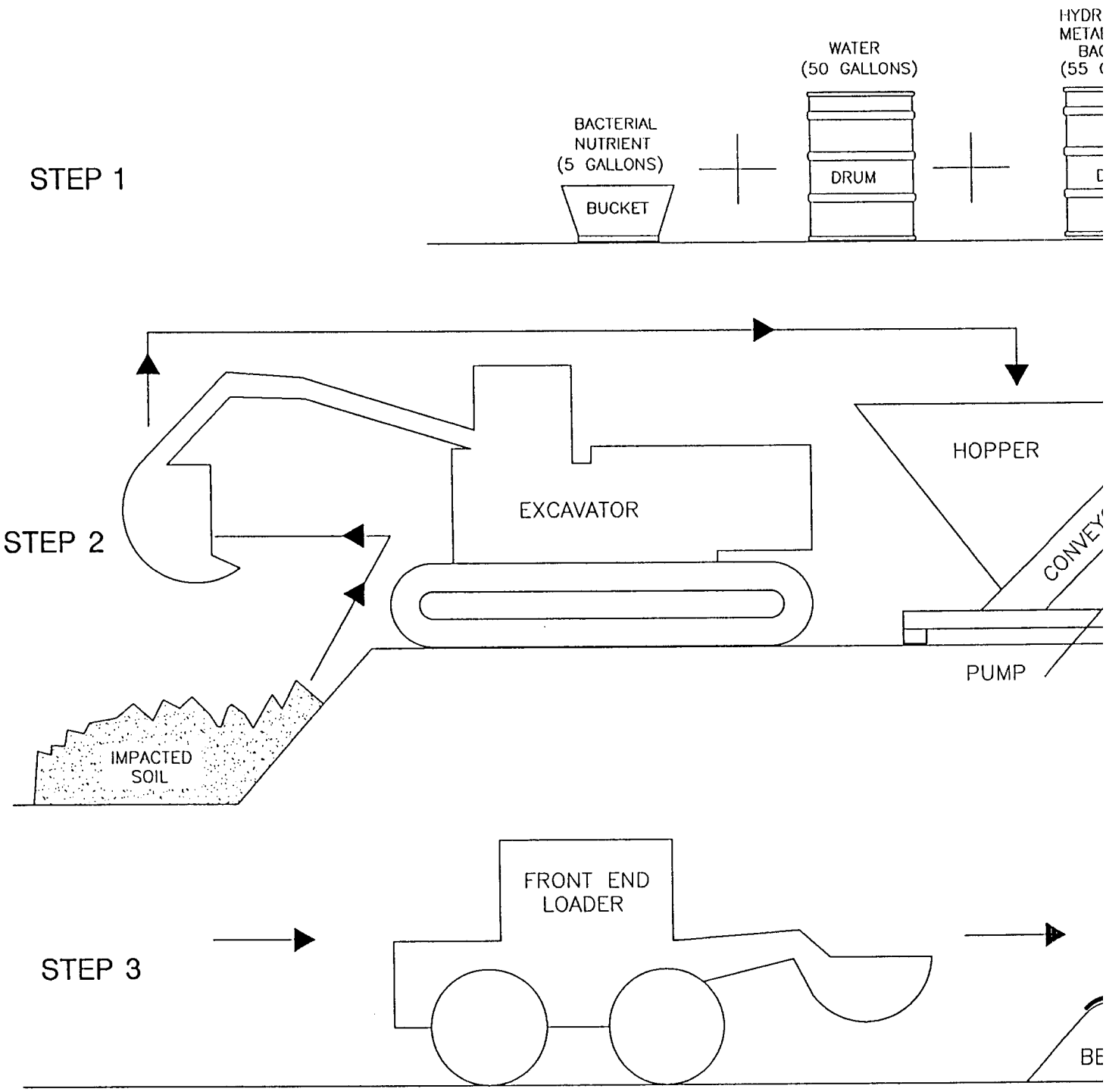
(2)

FIGURE 6



SEQUENCE OF OPERATIONS

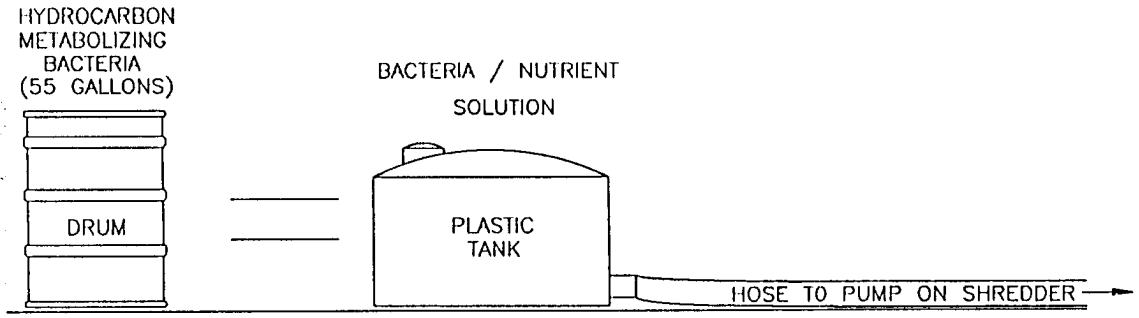
STEP 1

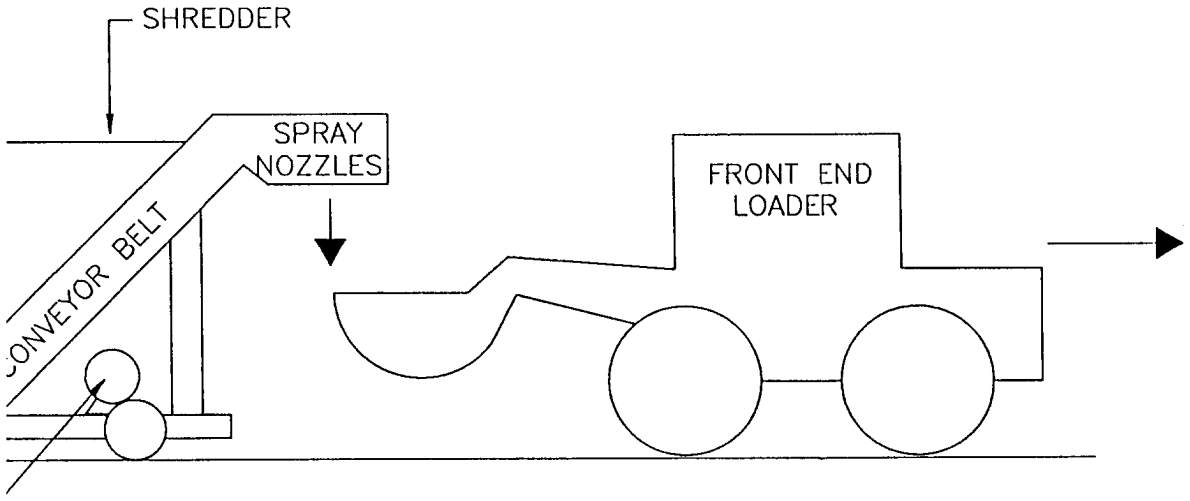
5 GALLONS OF BACTERIAL NUTRIENT WAS ADDED TO 50 GALLONS OF WATER. THIS MIXTURE WAS THEN ADDED TO 55 GALLONS OF LFS-1 HYDROCARBON METABOLIZING BACTERIA TO FORM THE BACTERIA/ NUTRIENT SOLUTION. BOTH THE BACTERIAL NUTRIENT AND THE HYDROCARBON METABOLIZING BACTERIA WERE SUPPLIED BY:

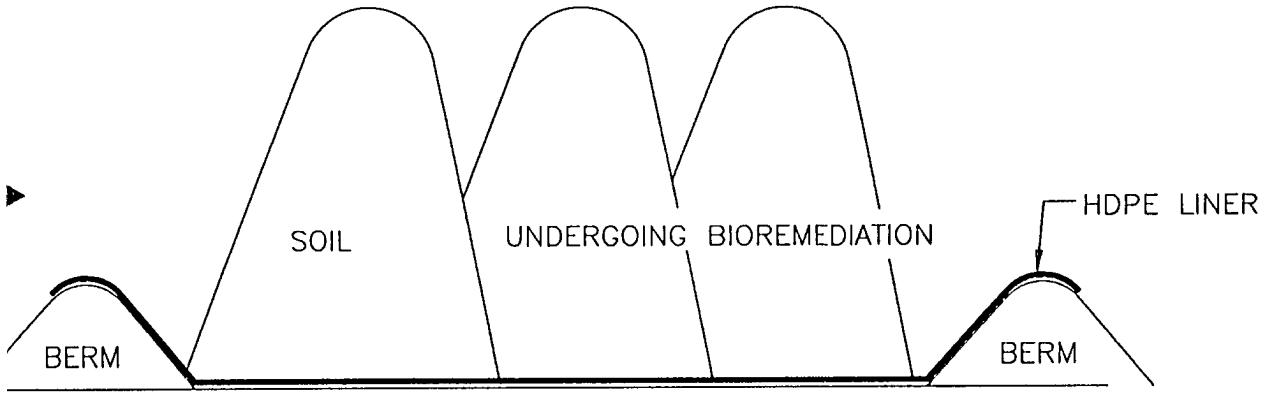
MICRO-TES
12500 NETWORK, SUITE 201
SAN ANTONIO, TEXAS 78249
(201) 558-4751

STEP 2

CONTAMINATED SOIL WAS EXCAVATED FROM THE AREA OF CONCERN USING A KOMATSU PC300LC TRACKED EXCAVATOR. THE CONTAMINATED SOIL WAS LOADED INTO THE HOPPER OF THE ROYER SHREDDER. CONTAMINATED SOIL MOVED THROUGH THE HOPPER AND UP A CONVEYOR BELT TO THE TOP OF THE MACHINE (ALONG THE WAY OVERSIZED MATERIAL WAS FILTERED OUT). AS CONTAMINATED SOIL WAS DISCHARGED FROM THE TOP OF THE SHREDDER, THE SOIL WAS INOCULATED WITH THE BACTERIA/ NUTRIENT SOLUTION THROUGH THE USE OF SPRAY BARS. APPROXIMATELY 1 GALLON OF THE BACTERIA/NUTRIENT SOLUTION WAS ADDED TO EACH CUBIC YARD OF CONTAMINATED SOIL.







STEP 3

THE SOIL INOCULATED WITH BACTERIA/NUTRIENT SOLUTION WAS TRANSPORTED FROM THE ROYER SHREDDER TO THE APPROPRIATE BIOCELL USING TWO KOMATSU RUBBER TIRE LOADERS (MODELS WA380 AND WA420). CONTAMINATED SOIL UNDERWENT BIOREMEDIATION IN THE BIOCELLS.

STEP 4

FOLLOWING BIOREMEDIATION, CONFIRMATORY SAMPLES WERE COLLECTED FOR ANALYSIS OF BENZENE, NAPHTHALENE, AND 2-METHYLNAPHTHALENE. SAMPLING LOCATIONS ARE SHOWN IN FIGURE 11. FOLLOWING RECEIPT OF ANALYTICAL RESULTS, REMEDIATED SOIL WAS PLACED BACK INTO THE EXCAVATIONS AS BACKFILL.

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SITE 4 - REMEDIATION FLOW DIAGRAM - EX-SITU BIOREMEDIATION

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ALPENA COMBAT READINESS TRAINING CENTER
ALPENA, MICHIGAN

Drawing Number
9

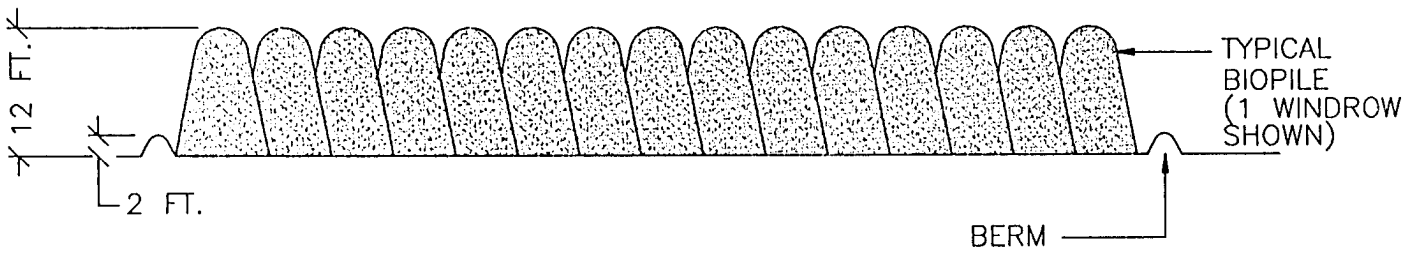
MONTGOMERY WATSON

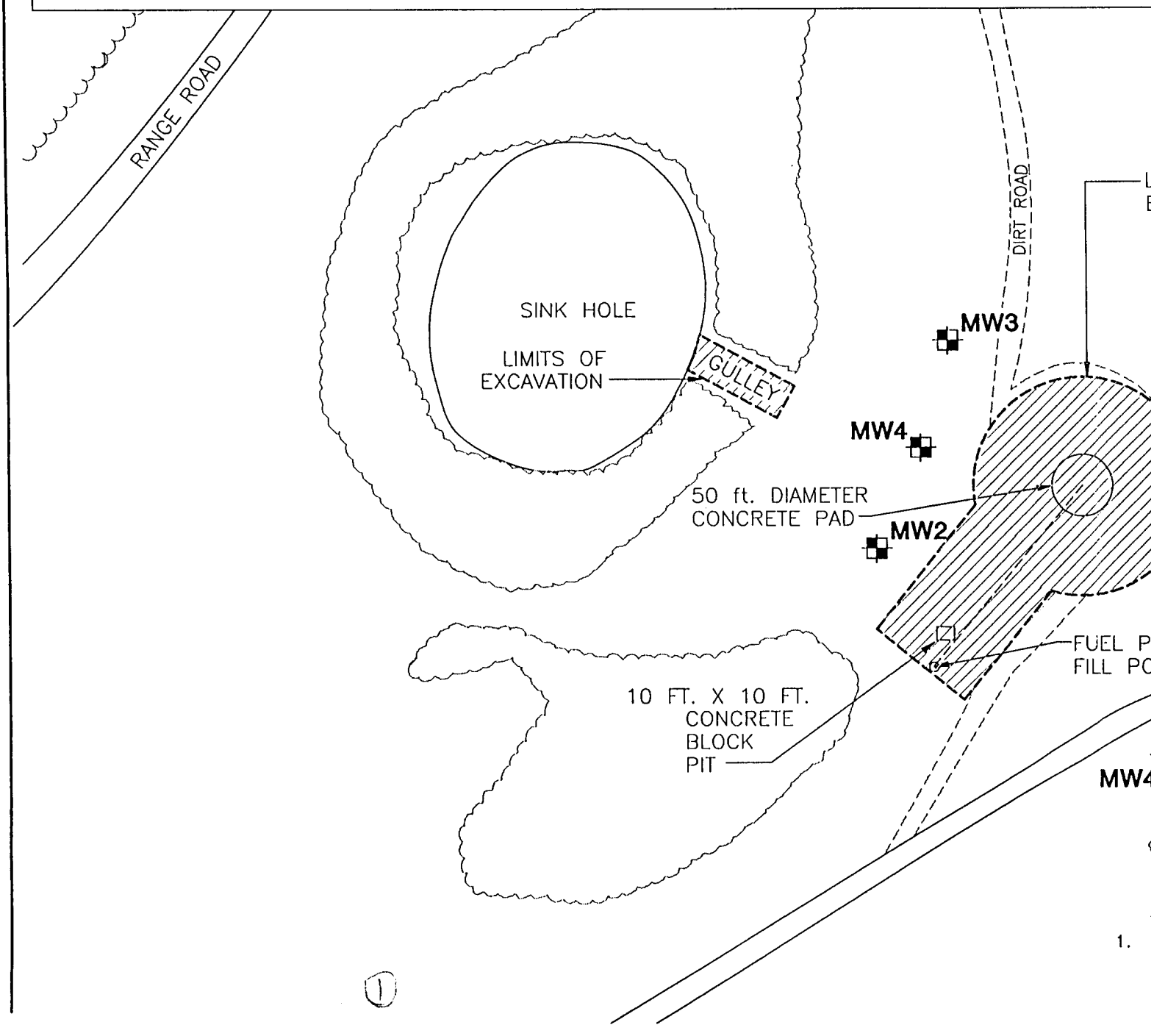
IL.

FIGURE 7

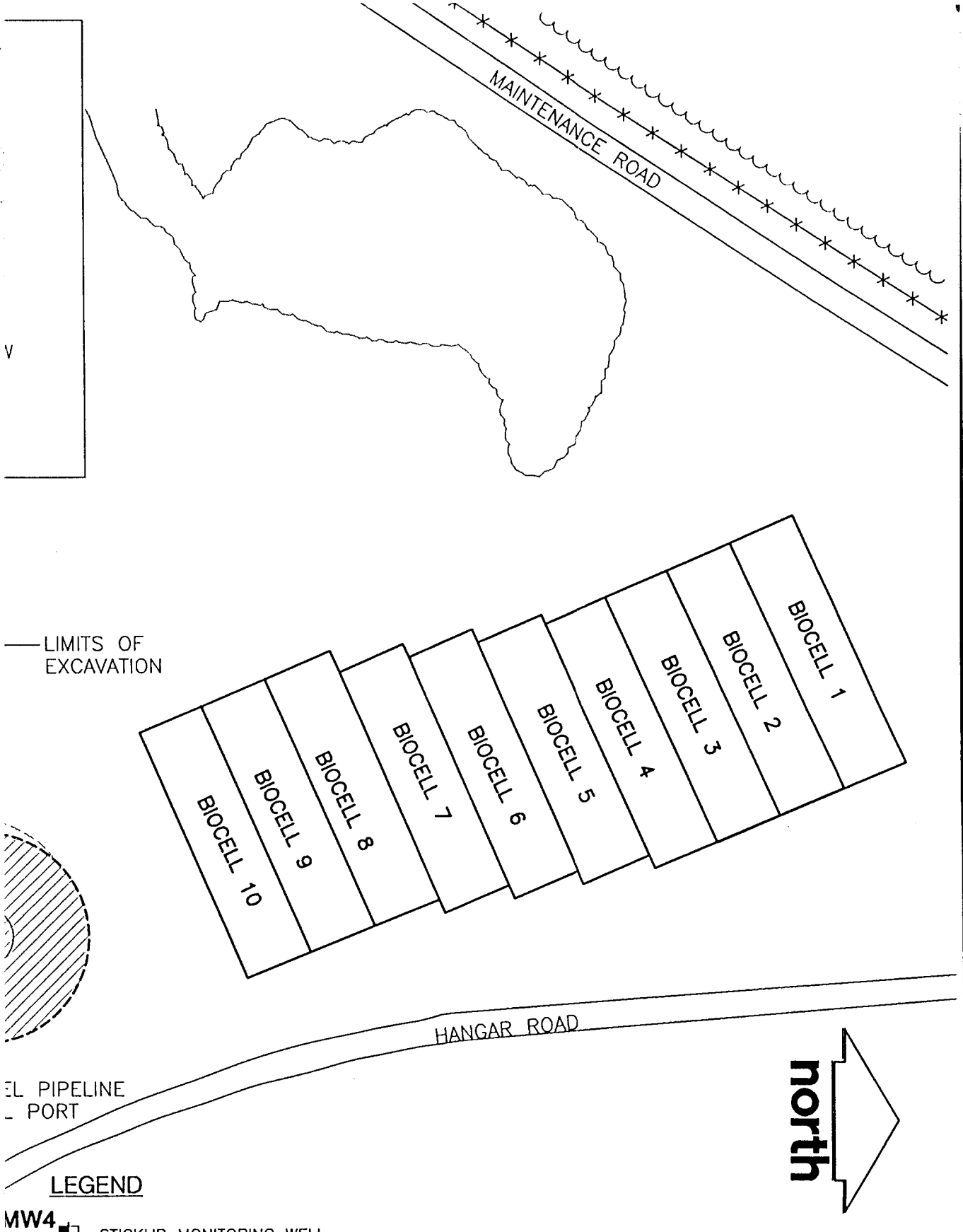
TYPICAL BIOCELL

TYPICAL BIOCELL CONSTRUCTION CONSISTED OF 2 WINDROWS OF SOIL. EACH WINDROW HELD 10 TO 15 BIOPILES OF SOIL. EACH BIOPILE HELD APPROXIMATELY 40 CYDS. OF SOIL. TOTAL SOIL PER BIOCELL IS APPROXIMATELY 1,000 TO 1,500 CUBIC YARDS.





(1)



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SITE 4 - LOCATION OF BIOCELLS

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ALPENA COMBAT READINESS TRAINING CENTER
ALPENA, MICHIGAN

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MONTGOMERY WATSON

biocell. Unico found this setup to be inefficient and consequently changed to the system described above (i.e., positioning the shredder adjacent to the excavation).

3.2.2 Construction Debris. In addition to the treatment of contaminated soils, remediation activities at Site 4 included disposal of the following debris at the BFI landfill in Onaway, Michigan:

- Approximately 90 cubic yards of concrete from the concrete pad and 180 feet of fuel pipeline (disposed as special waste); and

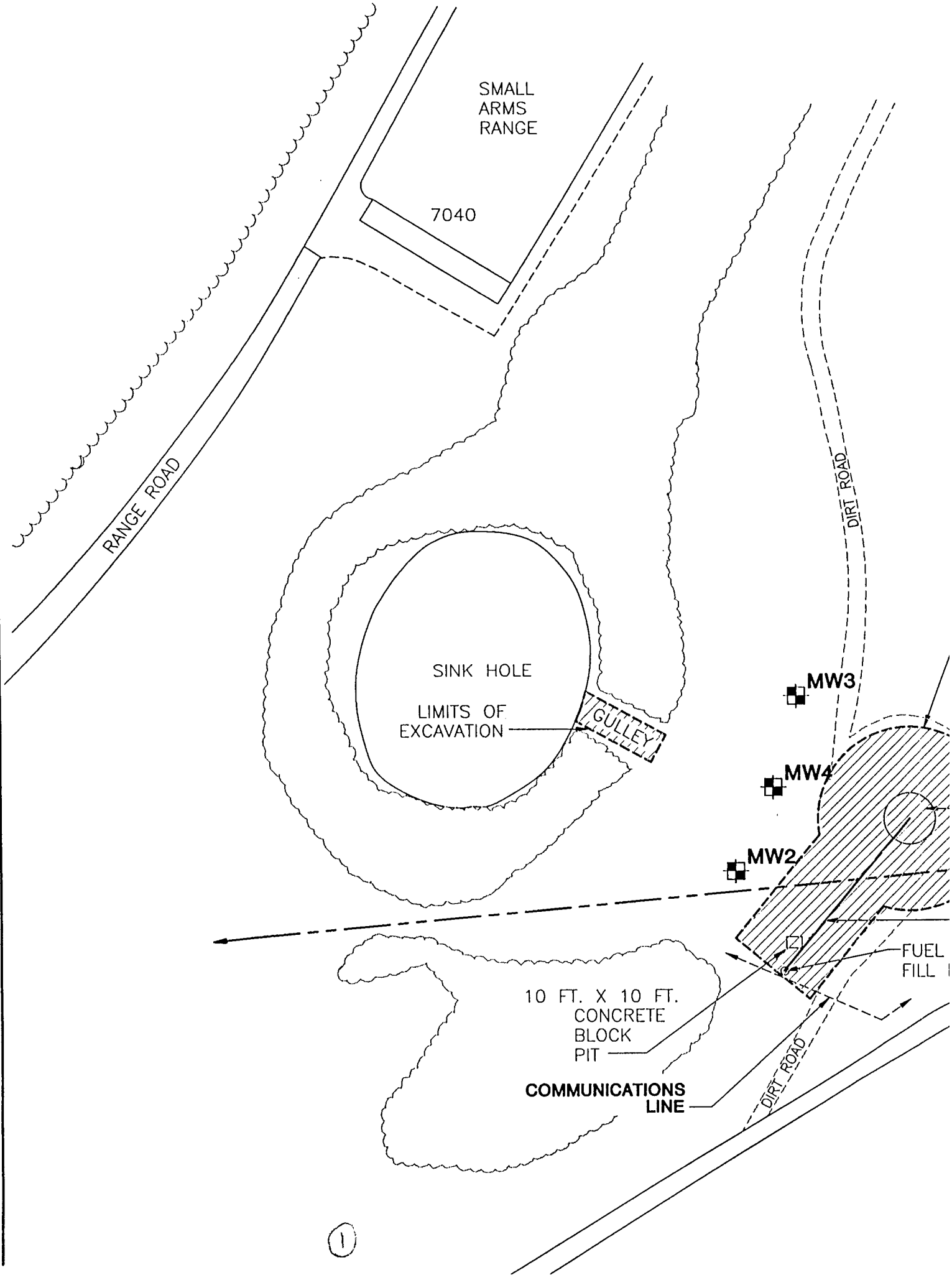
- Approximately 105 cubic yards of concrete and brick from the block pit and gully (disposed as construction debris).

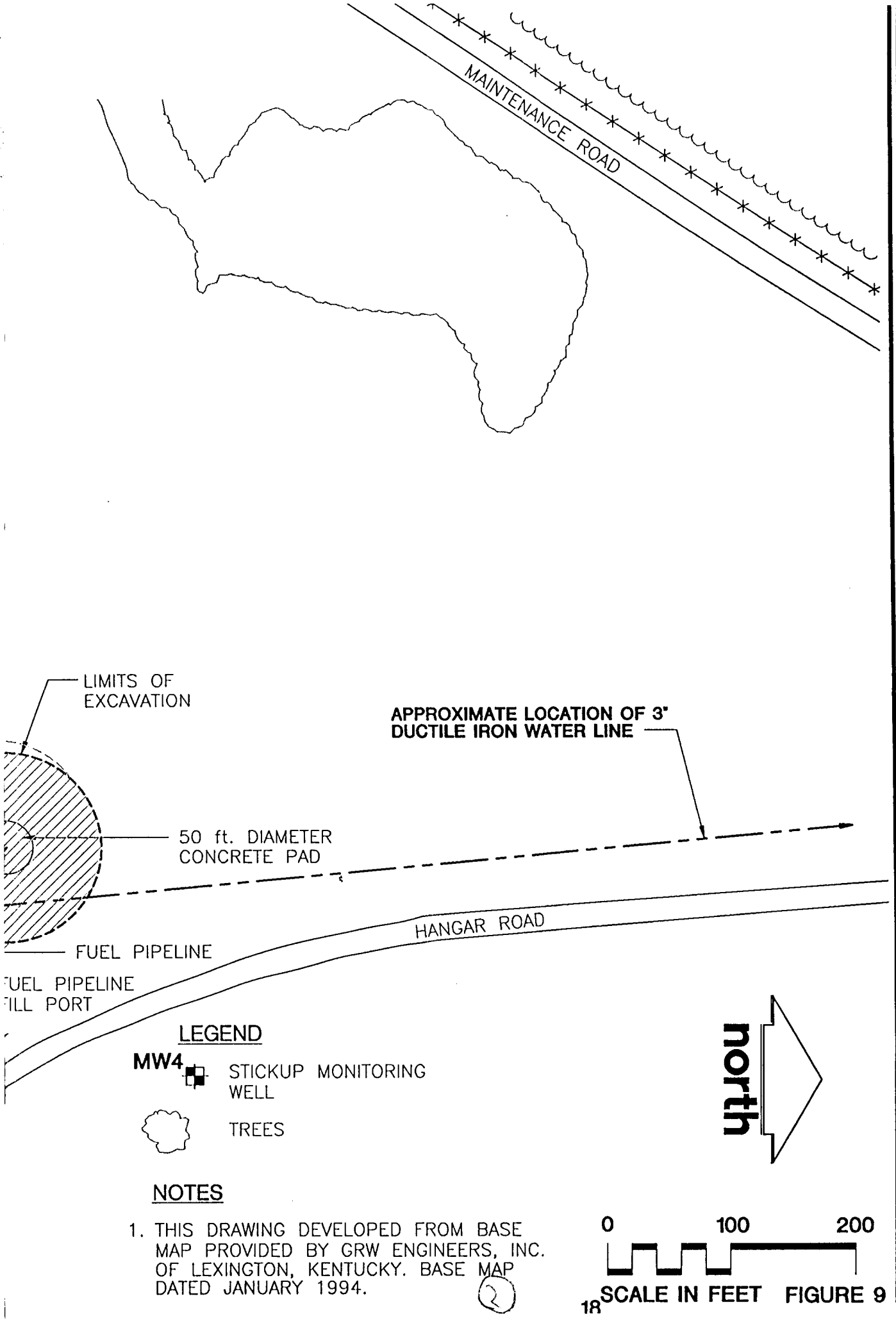
3.2.3 Damaged Utilities. Excavation of contaminated soil at Site 4 resulted in damage to a three inch ductile iron water line and a 50-pair communications cable (Figure 9). The three inch water line was damaged while excavating soil southeast of the concrete pad. The location of the water line had not been marked. To complete excavation of soils in this area, it was necessary to shut off and disconnect a section of this line. Following excavation of the contaminated soil, base personnel replaced the disconnected and damaged sections of waterline. The 50-pair communications cable was damaged while excavating soil east of the fuel pipeline. The location of the communications cable had been marked at the beginning of the project; however, the markings were not discernible at the time of the damage. Unico contacted the communications company and the damage was repaired.

3.2.4 Air Monitoring. Montgomery Watson contacted the Michigan Department of Natural Resources (MDNR) regarding the need for an air permit for this project. MDNR stated that an air permit would be required for this project unless it could be demonstrated that remediation activities would emit only non-carcinogenic VOCs and the quantity of emissions would be less than 1,000 pounds per month. MDNR stated that if the remediation contractor believed that an air permit was not required, the contractor must:

- Maintain a description of the remediation activities (process) throughout the life of the process or equipment; and
- Maintain records of material use and calculations identifying the quality, nature, and quantity of the VOC emissions in sufficient detail to demonstrate that the emissions are not more than 1,000 pounds per month.

Unico stated that the ex-situ bioremediation process using the shredder would comply with the requirements for a permit exemption and provided an air emissions estimate (Unico, April 1995) detailing this process. In addition, Unico performed periodic air monitoring during the remediation activities to support their emissions estimate. Unico's emission estimate is provided as Appendix F.


SMALL
ARMS
RANGE
7040
RANGE ROAD
DIRT ROAD
SINK HOLE
LIMITS OF
EXCAVATION
GULLEY
MW3
MW4
MW2
FUEL
FILL
10 FT. X 10 FT.
CONCRETE
BLOCK
PIT
COMMUNICATIONS
LINE
DIRT ROAD
1



NOTES

1. THIS DRAWING DEVELOPED FROM BASE MAP PROVIDED BY GRW ENGINEERS, INC. OF LEXINGTON, KENTUCKY. BASE MAP DATED JANUARY 1994.

FIGURE 9

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SITE 4 - DAMAGED UTILITIES

COMPLETION REPORT
ALPENA COMBAT READINESS TRAINING CENTER
ALPENA, MICHIGAN

Drawing Number
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MONTGOMERY WATSON

4.0 SAMPLING

Following remediation activities at Site 2 and Site 4, confirmatory samples were collected and analyzed to evaluate the effectiveness of the in-situ bioremediation, lead stabilization, and ex-situ bioremediation. The confirmatory samples were collected in accordance with Unico's June 1995 *Sampling and Analysis Plan* (SAP) (Appendix G) which incorporates comments from the Michigan Department of Natural Resources (MDNR). MDNR's comments regarding Unico's original SAP (dated April 1995) are recorded in the June 1, 1995 meeting minutes also included in Appendix G. A description of the confirmatory samples collected and analyzed at Site 2 and Site 4 is provided below.

4.1 SITE 2

Following application of the bacteria/nutrient solution to the TPH contaminated soil, the soil remained undisturbed for a period of one week while undergoing bioremediation. Confirmatory samples were then collected along the centerline of the ditch at 25 feet intervals beginning with station 0+00 and ending with station 1+50 as shown in Figure 10. Confirmatory samples were collected at a depth of approximately 8 to 12 inches below ground surface. These confirmatory samples were submitted for analysis of SVOCs by United States Environmental Protection Agency (EPA) method 8270.

Analytical results for these samples indicate non-detectable concentrations of SVOCs. SVOC analytical results and analytical method detection limits are summarized in Tables 1 and 2.

Prior to stabilization of the lead contaminated soil, soil samples were collected to determine existing lead concentrations in the soil. These samples were collected along the center line of the ditch at 50 foot intervals beginning with station 0+00 and ending with station 4+00. Samples were collected at a depth of approximately of 8 to 12 inches below grade. The lead concentration in these samples ranged from non-detectable to a high of 81 ppm (Table 1).

The sample exhibiting the highest lead concentration (i.e., 81 ppm at station 0+50) was submitted for further analysis of leachable lead by EPA method 1311 TCLP/7421 Lead. This sample exhibited a leachable lead concentration of 0.044 mg/L. The MDNR cleanup criteria for leachable lead is 0.004 mg/L.

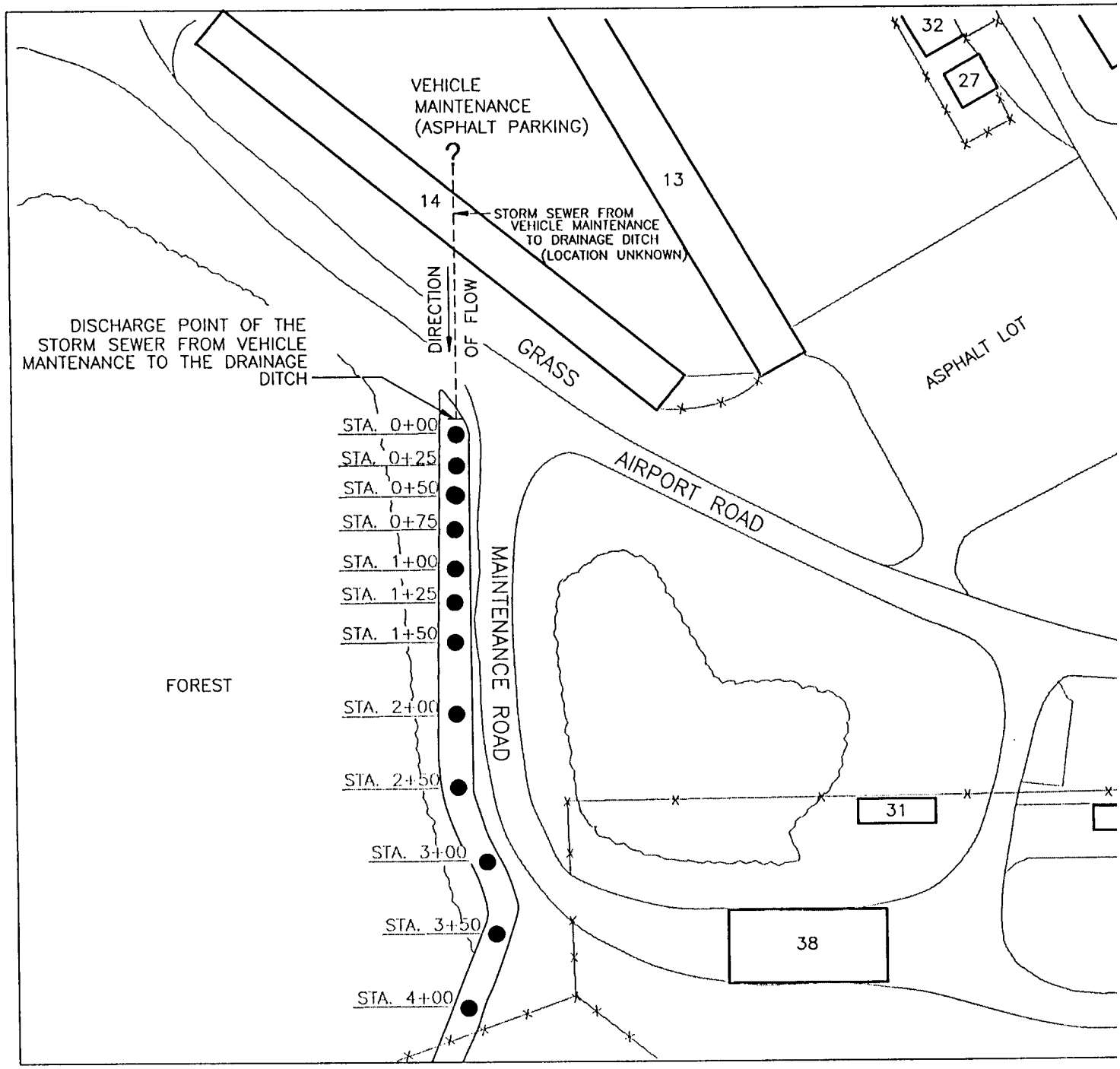
Following addition of the stabilization agent (i.e., Portland cement) to the lead contaminated soil, water was added to the soil/cement mixture and the mixture was left undisturbed for a period of three days. Confirmatory samples were then collected along the center line of the ditch at station 0+25, station 1+50, station 3+00, and station 4+00 (Figure 10). These samples were submitted for analysis of leachable lead by EPA method 1311 TCLP/7421 Lead.

Analytical results for these samples indicate non-detectable concentrations of lead with the exception of the confirmatory sample from station 0+25 (Table 3). The confirmatory sample from station 0+25 exhibited a leachable lead concentration of 0.008 mg/L. This sample was re-tested for leachable lead by EPA method 1312 SPLP/7421 Lead (as allowed under MDNR sampling guidelines). Using the SPLP procedure, the sample exhibited a leachable lead concentration of less than 0.003 mg/L.

4.2 SITE 4

Following excavation of the VOC and SVOC contaminated soil from the concrete pad, fuel pipeline, and gully areas, confirmatory samples were collected as described below. Additional confirmatory samples were collected from the soil stockpiled in the biocells following ex-situ bioremediation.

4.2.1 Concrete Pad. Excavation and sampling of the soil beneath the concrete pad (the former fire training area) was accomplished in three phases. The first phase included excavation of the soil to a depth of approximately 20 feet below grade. At this depth, one sidewall sample and one floor sample were collected and submitted for analysis of benzene



LEGEND

15	BUILDING AND BUILDING NUMBER
×——×	FENCE
	TREES
- - - - - -	STORM SEWER (SEE NOTE 2)
●	SAMPLING LOCATION (SEE ATTACHED SAMPLING SCHEDULE FOR LISTING OF ANALYSES)

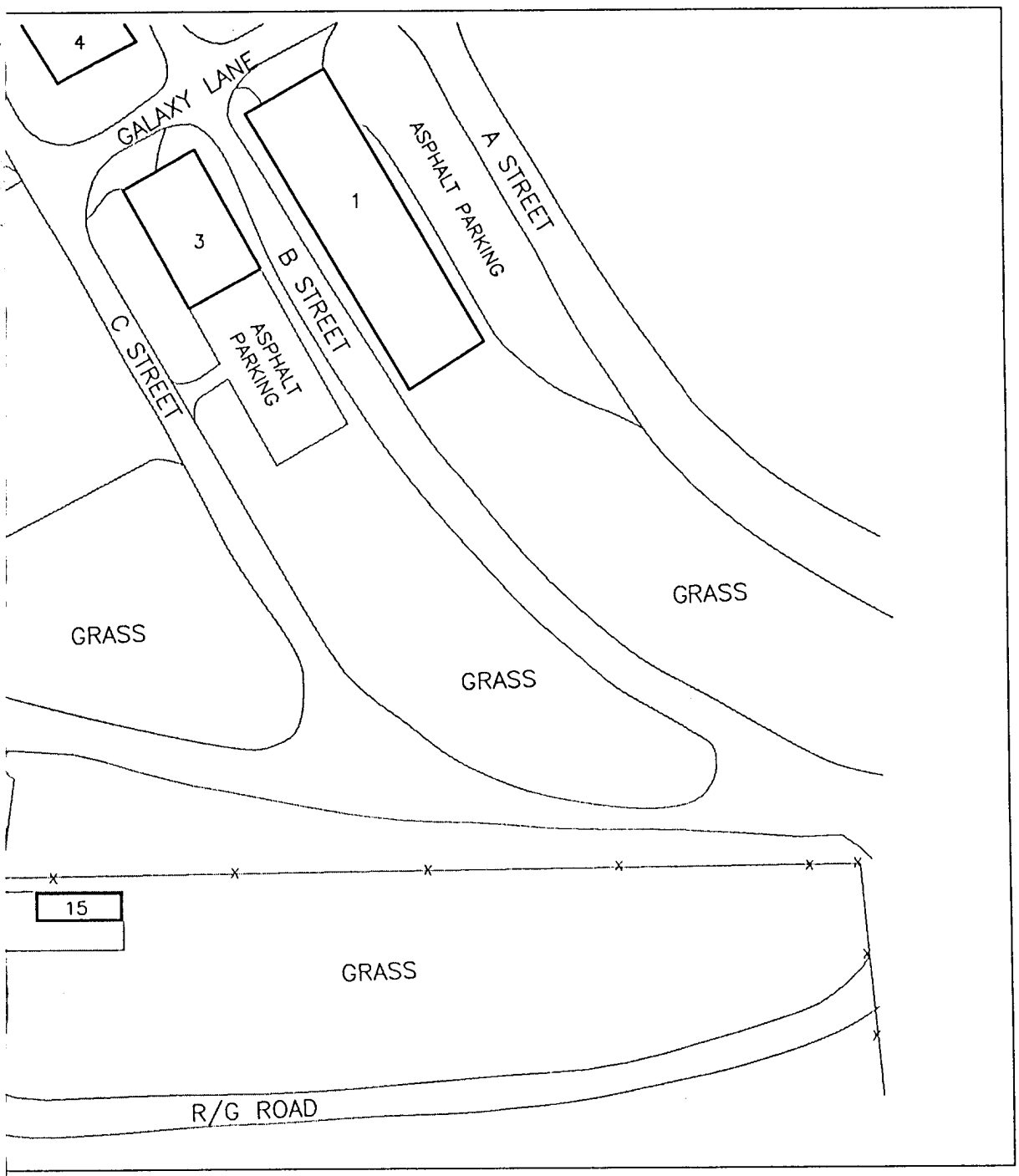
NOTES:

1. THIS DRAWING DEVELOPED FROM BASE MAP PROVIDED BY GRW ENGINEERS, INC. OF LEXINGTON, KENTUCKY. BASE MAP DATED JANUARY 1994.
2. STATIONING FOR THE DRAINAGE DITCH BEGINS WITH STATION 0+00 LOCATED AT THE DISCHARGE POINT OF THE STORM SEWER FROM VEHICLE MAINTENANCE INTO THE DRAINAGE DITCH.

(1)

SAMPLING SC

STATION	LEAD (EPA METHOD 7420)	L
0+00	X	
0+25		
0+50	X	
0+75		
1+00	X	
1+25		
1+50	X	
2+00	X	
2+50	X	
3+00	X	
3+50	X	
4+00	X	



G SCHEDULE

	TCLP LEAD (EPA METHOD 1311 TCLP/ 7421 LEAD)	SVOCs (EPA METHOD 8270)
		X
	X	X
	X	X
		X
		X
		X
	X	X
	X	
	X	

north

0 100 200

SCALE IN FEET

21

FIGURE 10

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SITE 2 - SAMPLING LOCATIONS

COMPLETION REPORT
ALPENA COMBAT READINESS TRAINING CENTER
ALPENA, MICHIGAN

Drawing Number
6

MONTGOMERY WATSON

Table 1

Site 2 Sampling - Post Bioremediation, Pre-Stabilization
Alpena Combat Readiness Training Center
Alpena, Michigan

SAMPLE ID	TOTAL LEAD (mg/kg)	SVOC's (see Note 2)
S2-01-DD-00	3	ND
S2-01-DD-00-DUP	ND	ND
S2-01-DD-25	NA	ND
S2-01-DD-50	81 (TCLP LEAD = .044mg/l)	ND
S2-01-DD-75	NA	ND
S2-01-DD-100	28	ND
S2-01-DD-125	NA	ND
S2-01-DD-150	10	ND
S2-01-DD-200	23	NA
S2-01-DD-250	3	NA
S2-01-DD-300	ND	NA
S2-01-DD-350	ND	NA
S2-01-DD-400	31	NA

NOTES

1. All samples collected following in-situ bioremediation but prior to stabilization.
2. ND = Non Detect. Method detection limit for Total Lead = 1 mg/kg. SVOCs analyzed by EPA method 8270 for Base-Neutral-Acids by GC/MS. Method detection limits for SVOC analytes are shown in Table 2.
3. NA = Not Analyzed.
4. All samples collected from the center of the drainage ditch (prior to storm water piping installation) at 8 to 12 inches below grade.

Table 2

Site 2 - Method Detection Limits for SVOC Analytes Alpena Combat Readiness Training Center Alpena, Michigan

ANALYTE	METHOD DETECTION LIMIT	ANALYTE	METHOD DETECTION LIMIT
Azobenzene	330	3-Nitroaniline	1700
Bis(2-Chloroethxy)Methane	330	4-Nitroaniline	1700
Bis(2-Chloroethyl)Ether	330	Acenaphthene	330
Bis(2-Ethylhexyl)Phthalate	330	Acenaphthylene	330
Bis(2-Chloroisopropyl)Ether	330	Anthracene	330
4-Bromophenylphenyl Ether	330	Benz(a)Anthracene	330
Butyl Benzyl Phthalate	330	Benzo(a)Pyrene	330
4-Chlorophenylphenyl Ether	330	Benzo(b)Fluoranthene	330
Diethyl Phthalate	330	Benzo(g,h,i)Perylene	330
Dimethyl Phthalate	330	Benzo(k)Fluoranthene	330
Di-n-Butyl Phthalate	330	Chrysene	330
Di-n-Octyl Phthalate	330	Dibenz(a,h)Anthracene	330
N-Nitrosodi-n-Propylamine	330	Fluoranthene	330
N-Nitrosodiphenylamine	330	Fluorene	330
2-Chloronaphthalene	330	Indeno(1,2,3-cd)Pyrene	330
1,2-Dichlorobenzene	330	Naphthalene	330
1,3-Dichlorobenzene	330	Phenanthrene	330
1,4-Dichlorobenzene	330	Pyrene	330
2,4-Dinitrotoluene	330	Benzidine	5000
2,6-Dinitrotoluene	330	3,3-Dichlorobenzidine	2000
Hexachlorobenzene	330	4-Chloro-3-Methyphenol	330
Hexachlorobutadiene	330	2-Chlorophenol	330
Hexachlorocyclopentadiene	330	2,4-Dichlorophenol	330
Hexachloroethane	330	2,4-Dimethylphenol	330
Isophorone	330	2,4-Dinitrophenol	1700
Nitorbenzene	330	2-Methyl-4,6-Dinitrophenol	1700
1,2,4-Trichlorobenzene	330	2-Nitrophenol	330
Benzoic Acid	3300	4-Nitrophenol	1700
Aniline	1700	Pentachlorophenol	1700
Benzyl Alcohol	1300	Phenol	330
4-Chloroaniline	1300	2,4,5-Trichlorophenol	1700
Dibenzofuran	330	2,4,6-Trichlorophenol	330
2-Methylnaphthalene	330	2-Methylphenol	330
2-Nitroaniline	1700	4-Methylphenol	330

NOTES
1. Analysis done by EPA 8170 Base-Neutral-Acids GC/MS.

Table 3

Site 2 Sampling - Post Stabilization
Alpena Combat Readiness Training Center
Alpena, Michigan

SAMPLE ID	TCLP LEAD (mg/l)
S2-02-DD-25	.008 (SPLP = Non-detect)
S2-02-DD-150	ND
S2-02-DD-300	ND
S2-02-DD-400	ND

NOTES

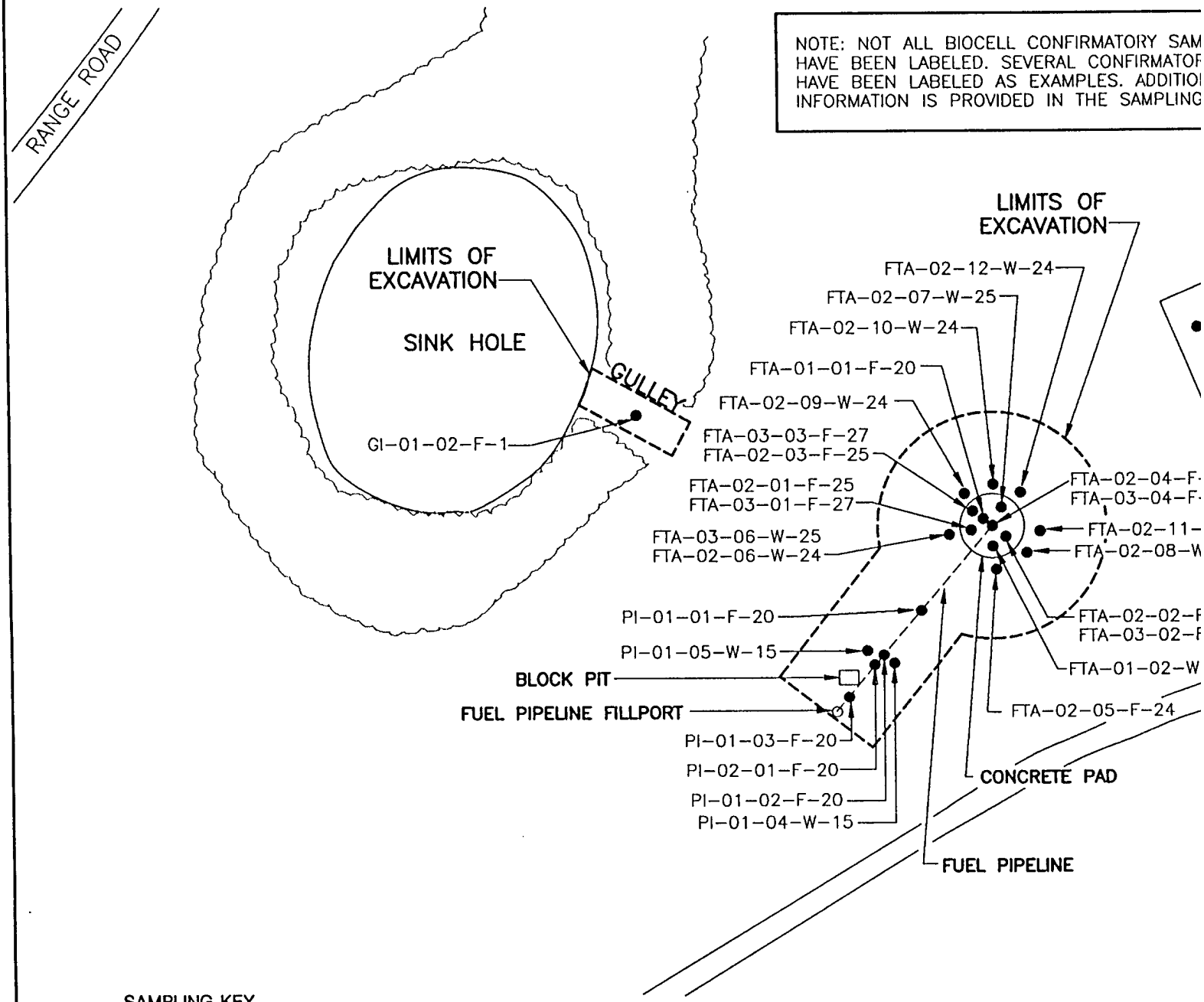
1. All samples collected following stabilization treatment from the center of the drainage ditch (prior to storm water piping installation) at 0 to 12 inches below grade.
2. ND = Non-detect. Method detection limit for TCLP lead = 0.003 mg/l (done by EPA 1311 TCLP/EPA 7421 Lead). Method detection limit for SPLP lead = 0.003 mg/l (done by EPA 1312 SPLP/EPA 7421 Lead).

(EPA method 5030/8020), naphthalene (EPA method 8270), and 2-methylnaphthalene (EPA method 8270) (Figure 11). Analytical results for the sidewall sample indicate non-detectable contaminant concentrations (Table 4). The floor sample exhibited a 2-methylnaphthalene concentration of 2,140 ug/kg. The MDNR default cleanup criteria for 2-methylnaphthalene is 330 ug/kg. (Note: For those contaminants that do not have established clean up criteria, the default cleanup criteria is set equal to the acceptable method detection limit.)

Based on the elevated 2-methylnaphthalene concentration found in the floor sample, the second phase included excavation to a depth of approximately 25 feet below grade. At this depth, seven sidewall samples and five floor samples were collected and submitted for analysis of benzene, naphthalene, and 2-methylnaphthalene (Figure 11). Analytical results for these samples indicate non-detectable contaminant concentrations with the exception of the sidewall sample from the southern wall of the excavation (sample FTA-02-06-W) (Table 4). This sample exhibited a 2-methylnaphthalene concentration of 590 ug/kg. The 2-methylnaphthalene concentration in the floor samples ranged from non-detectable to a high of 10,500 ug/Kg.

Based on the elevated 2-methylnaphthalene concentrations, the third phase included excavation to a depth of approximately 27 feet below grade. At this depth one sidewall sample and four floor samples were collected and submitted for analysis of 2-methylnapthalene (Figure 11). Analytical results for these samples indicate non-detectable concentrations of 2-methylnapthalene (Table 4).

4.2.2 Fuel Pipeline. Following excavation of the soil beneath the fuel pipeline, two sidewall samples and three floor samples were collected and submitted for analysis of benzene, naphthalene, and 2-methylnaphthalene (Figure 11). Analytical results for these samples indicate non-detectable contaminant concentrations (Table 5).



NOTE: NOT ALL BIOCELL CONFIRMATORY SAM
HAVE BEEN LABELED. SEVERAL CONFIRMATOR
HAVE BEEN LABELED AS EXAMPLES. ADDITIO
INFORMATION IS PROVIDED IN THE SAMPLING

SAMPLING KEY

FTA - 02 - 07 - W - 25

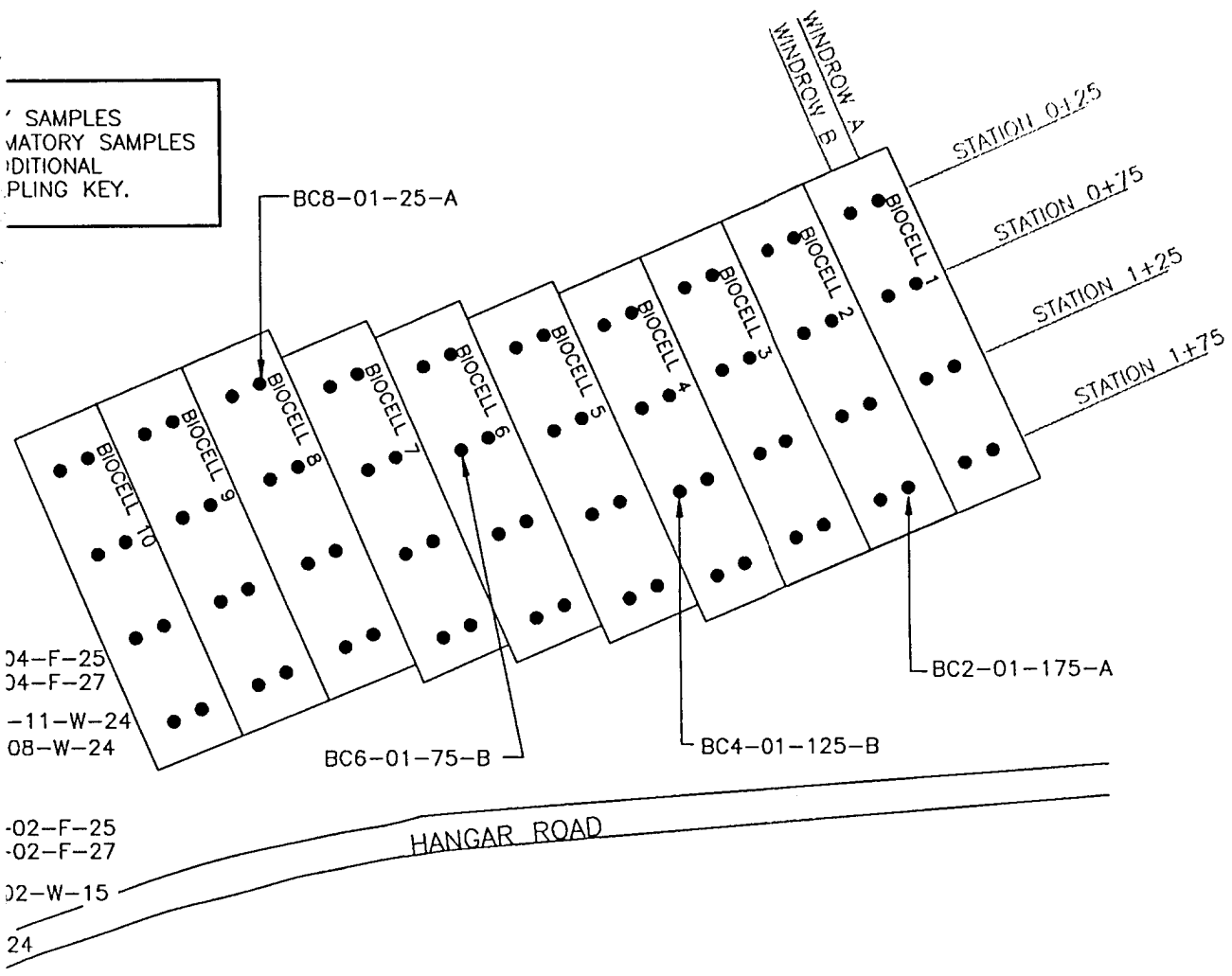
- 25 = SAMPLE DEPTH
- W = SAMPLE LOCATION: W = WALL, F = FLOOR
- 07 = SAMPLE NUMBER
- 02 = SAMPLE PHASE: 01 = 1st. PHASE, 02 = 2nd. PHASE, 03 = 3rd. PHASE
- FTA = SAMPLE AREA: FTA = FIRE TRAINING AREA, PI = FUEL PIPELINE, GI = GULLEY

BC4 - 01 -125 - A

- A = WINDROW DESIGNATION: A IS NORTHERN WINDROW, B IS SOUTHERN WINDROW
- 125 = STATION NUMBER (SEE GRID NORTH OF BIOCELLS)
- 01 = SAMPLE PHASE: 01 = 1st. PHASE (ONLY 1 PHASE COLLECTED)
- BC4 = BIOCELL NUMBER (e.g., BC4 = BIOCELL #4)

TYPICAL BIOCELL

TYPICAL BIOCELL CONSTRUCTION CONSISTED OF 2 WINDROWS OF SOIL. EACH WINDROW HELD 10 TO 15 BIOPILES OF SOIL. EACH BIOPILE HELD APPROXIMATELY 40 CYDS. OF SOIL. TOTAL SOIL PER BIOCELL WAS APPROXIMATELY 1,000 TO 1,500 CUBIC YARDS.



LEGEND

- CONFIRMATORY SAMPLE COLLECTED AND ANALYZED FOR BENZENE (EPA 5030/8020), NAPHTHALENE (EPA 8270), AND 2-METHYLNAPHTHALENE (EPA 8270). THIRD PHASE FIRE TRAINING AREA SAMPLES ANALYZED FOR 2-METHYLNAPHTHALENE ONLY.

NOTES:

1. THIS DRAWING DEVELOPED FROM BASE MAP PROVIDED BY GRW ENGINEERS, INC. OF LEXINGTON, KENTUCKY. BASE MAP DATED JANUARY 1994.
2. SAMPLE LOCATIONS TAKEN FROM UNICO'S FINAL REPORT FOR SITE 2 AND SITE 4 BIOREMEDIATION ACTIVITIES (UNICO, AUGUST 1995)

0 100 200

SCALE IN FEET

north

Developed By BTM | Drawn By EBM
Approved By DJB | Date 9/21/95
Reference ISSUED FOR COMPLETION REPORT 9/21/95
Revisions DRAFT FINAL COMP. REPORT NOV. 1995

SITE 4 - SAMPLING LOCATIONS

COMPLETION REPORT
ALPENA COMBAT READINESS TRAINING CENTER
ALPENA, MICHIGAN

Drawing Number
12

MONTGOMERY WATSON

FIGURE 11

Table 4

Site 4 Confirmatory Sampling - Concrete Pad
Alpena Combat Readiness Training Center
Alpena, Michigan

SAMPLE ID	SAMPLE DEPTH (ft. below grade)	BENZENE (ug/kg)	NAPHTHALENE* (ug/kg)	2-METHYLNAPHTHALENE* (ug/kg)
1ST PHASE				
FTA-01-01-F (S4-01-01-F)	20	ND	ND	2,140
FTA-01-02-W (S4-01-W)	15	ND	ND	ND
2ND PHASE				
FTA-02-01-F	25	ND	ND	2,140
FTA-02-02-F	25	ND	ND	2,390
FTA-02-03-F	25	ND	2,500	10,500
FTA-02-04-F	25	ND	890	8,240
FTA-02-05-F	24	ND	ND	ND
FTA-02-06-W	24	ND	ND	590
FTA-02-07-W	25	ND	ND	ND
FTA-02-08-W	24	ND	ND	ND
FTA-02-09-W	24	ND	ND	ND
FTA-02-10-W	24	ND	ND	ND
FTA-02-11-W	24	ND	ND	ND
FTA-02-12-W	24	ND	ND	ND
FTA-02-12-W-DUP	24	ND	ND	ND
3RD PHASE				
FTA-03-01-F	27	NA	NA	ND
FTA-03-02-F	27	NA	NA	ND
FTA-03-03-F	27	NA	NA	ND
FTA-03-04-F	27	NA	NA	ND
FTA-03-06-W	25	NA	NA	ND

NOTES

1. ND = Non-detect. Method detection limit for benzene = 10 ug/kg (EPA 5030/8020), MDL for naphthalene = 330 ug/kg (EPA 8270), MDL for 2-methynaphthalene = 330 ug/kg (EPA 8270).
2. NA = Not Analyzed.
3. * indicates that concentration calculated on a dry weight basis.

Table 5

Site 4 Confirmatory Samples - Pipeline and Gully
Alpena Combat Readiness Training Center
Alpena, Michigan

SAMPLE ID	SAMPLE DEPTH (ft. below grade)	BENZENE (ug/kg)	NAPHTHALENE (ug/kg)	2-METHYLNAPHTHALENE (ug/kg)
PIPELINE				
PI-01-01-F	20	ND	ND	ND
PI-01-02-F	20	ND	ND	ND
PI-01-03-F	20	ND	ND	ND
PI-01-03-F-DUP	20	ND	ND	ND
PI-01-04-W	15	ND	ND	ND
PI-01-05-W	15	ND	ND	ND
PI-02-01-F*	20	NA	NA	NA
GULLY				
GI-01-02-F	1	ND	ND	ND

NOTES

1. ND = Non-detect. Method detection limit for benzene = 10 ug/kg (EPA 5030/8020), MDL for naphthalene = 330 ug/kg (EPA 8270), MDL for 2-methylnaphthalene = 330 ug/kg (EPA 8270).
2. NA = Not Analyzed.
3. * Indicates that sample was analyzed for bis (2-ethylhexyl) phthalate and found to be non-detect. Method detection limit for bis (2-ethylhexyl) phthalate = 330 ug/kg (EPA 8270).

4.2.3 Gully. Following excavation of the soil from the gully, one confirmatory sample was collected and submitted for analysis of benzene, naphthalene, and 2-methylnaphthalene (Figure 11). Analytical results for these samples indicate non-detectable contaminant concentrations (Table 5).

4.2.4 Biocells. Following inoculation of the excavated soil with the bacteria/nutrient solution, the soil remained undisturbed in the biocells for approximately three to four weeks. Confirmatory samples were then collected and submitted for analysis of benzene, naphthalene, and 2-methylnaphthalene. Confirmatory samples were collected from both windrows of each biocell at station 0+25, station 0+75, station 1+25, and station 1+75 (station 0+00 for each windrow was located at the western end of the biocell) (Figure 11). Analytical results for these samples indicate non-detectable contaminant concentrations (Table 6).

4.3 QUALITY ASSURANCE/QUALITY CONTROL

Duplicate confirmatory samples were collected and analyzed as shown on Table 1, Table 4, Table 5, and Table 6.

Table 6

Site 4 Confirmatory Samples - Biocells
Alpena Combat Readiness Training Center
Alpena, Michigan

SAMPLE ID	CONFIRMATORY SAMPLES (ug/kg)
BC1-01-25-A	ND
BC1-01-25-B	ND
BC1-01-75-A	ND
BC1-01-75-B	ND
BC1-01-125-A	ND
BC1-01-125-B	ND
BC1-01-175-A	ND
BC1-01-175-B	ND
BC2-01-25-A	ND
BC2-01-25-B	ND
BC2-01-75-A	ND
BC2-01-75-B	ND
BC2-01-125-A	ND
BC2-01-125-B	ND
BC2-01-175-A	ND
BC2-01-175-B	ND
BC2-01-175-B-DUP	ND
BC3-01-25-A	ND
BC3-01-25-B	ND
BC3-01-75-A	ND
BC3-01-75-B	ND
BC3-01-125-A	ND
BC3-01-125-B	ND
BC3-01-175-A	ND
BC3-01-175-B	ND
BC4-01-25-A	ND
BC4-01-25-A-DUP	ND
BC4-01-25-B	ND
BC4-01-75-A	ND
BC4-01-75-B	ND
BC4-01-125-A	ND
BC4-01-125-B	ND
BC4-01-175-A	ND
BC4-01-175-B	ND
BC4-02-01	ND
BC5-01-25-A	ND
BC5-01-25-B	ND
BC5-01-75-A	ND
BC5-01-75-B	ND
BC5-01-125-A	ND
BC5-01-125-B	ND
BC5-01-175-A	ND
BC5-01-175-B	ND
BC6-01-25-A	ND
BC6-01-25-B	ND
BC6-01-75-A	ND
BC6-01-75-B	ND
BC6-01-125-A	ND
BC6-01-125-B	ND
BC6-01-175-A	ND
BC6-01-175-B	ND
BC7-01-25-A	ND
BC7-01-25-A-DUP	ND
BC7-01-25-B	ND
BC7-01-75-A	ND
BC7-01-75-B	ND
BC7-01-125-A	ND
BC7-01-125-B	ND
BC7-01-175-A	ND
BC7-01-175-B	ND
BC8-01-25-A	ND
BC8-01-25-B	ND
BC8-01-75-A	ND
BC8-01-75-B	ND
BC8-01-125-A	ND
BC8-01-125-B	ND
BC8-01-175-A	ND
BC8-01-175-B	ND
BC9-01-25-A	ND
BC9-01-25-B*	ND
BC9-01-75-A	ND
BC9-01-75-B	ND
BC9-01-125-A	ND
BC9-01-125-B	ND
BC9-01-175-A	ND
BC9-01-175-A-DUP	ND
BC9-01-175-B	ND
BC10-01-25-A	ND
BC10-01-25-B	ND
BC10-01-75-A	ND
BC10-01-75-B	ND
BC10-01-125-A	ND
BC10-01-125-B	ND
BC10-01-175-A	ND
BC10-01-175-B	ND

1. ND = Non-detect. All confirmatory samples analyzed for benzene (MDL = 10 ug/kg), napthalene (MDL = 330 ug/kg), and 2-methylnapthalene (MDL = 330 ug/kg).
2. * Indicates that sample was analyzed for bis (2-ethylhexyl) phthalate and found to be non-detect. Method detection limit for bis (2-ethylhexyl) phthalate = 330 ug/kg (EPA 8270).

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5.0 CONCLUSIONS

Based on the confirmatory sampling analytical results, the contaminated soils at Site 2 and Site 4 of the Alpena CRTC have been remediated in accordance with the United States Property and Fiscal Officer's Request for Technical Proposal. No further action is required at Site 2 and Site 4 with respect to the Installation Restoration Program.

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A

USPFO's Request for Technical Proposal

AIR NATIONAL GUARD
INSTALLATION RESTORATION PROGRAM

REQUEST FOR PROPOSAL

FOR
CONSTRUCTION OF A
BIOREMEDIATION SYSTEM

PROJECT NO. TDVG947183

MICHIGAN AIR NATIONAL GUARD
ALPENA COMBAT READINESS TRAINING
CENTER
ALPENA, MICHIGAN

JUNE 1994

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AIR NATIONAL GUARD
INSTALLATION RESTORATION PROGRAM

REQUEST FOR PROPOSAL

FOR CONSTRUCTION OF A
BIOREMEDIATION SYSTEM

PROJECT NO. TDVG957183

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ALPENA COMBAT READINESS TRAINING CENTER
ALPENA, MICHIGAN

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SECTION 1

OBJECTIVE

The Michigan Air National Guard (MIANG), Alpena Combat Readiness Training Center (CRTC) wishes to solicit proposals for the construction of a ex-situ bioremediation system. The Base is located at 5884 A Street, Alpena, Michigan, adjacent to the Alpena Regional County Airport. The Base contact is Captain Fred Kimble, Base Environmental Coordinator.

The bioremediation system is to be located in an area where the soil is contaminated with petroleum hydrocarbons and lead. The successful company shall provide the design and construction of a bioremediation system (in-situ or ex-situ) capable of reducing the existing petroleum hydrocarbon levels to below the state clean-up action levels and stabilization of lead by means of lime induction. Stabilized soil will be used to create a concrete lined ditch at Site 2. The successful proposal package shall be prepared according to the guidelines established in the following specifications.

Proposal packages submitted for review shall include the company's experience record, detailed bioremediation system design, construction/performance schedule and cost breakdown. Evaluation of proposals will be based on the contractor's experience, the technical merits of the bioremediation system design and the cost.

criteria is 5,000 ppb. The TPH detected in the soil samples correlates with the SVOCs detected in these samples. TPH was detected in all samples from 36.6 ppm to 9160 ppm. As expected, boring PO4B7 (in the center of the FTA) showed the largest concentrations of TPH (257 ppm to 9160 ppm).

SECTION 3

SCOPE OF WORK

The prospective proposal packages shall include the following information to be reviewed by the Michigan Air National Guard (MIANG) and its authorized representatives:

o Company information in the form of brochures, experience record, past job history, etc.

o Bioremediation system design data including plans, equipment specifications and material information, signed by a registered professional engineer in the State of Michigan.

o Schedule for construction (installation) activities and periodic testing (including final verification sampling and report).

o Project shall be proposed on a lump sum basis, but an itemized cost breakdown shall be submitted for review.

In their proposals, the prospective companies shall make provisions for all those requirements outlined in the request for proposal.

3.1 INFORMATION ON SITE CONDITIONS

Information regarding site conditions, subsurface information, construction of existing site facilities as applicable, buried utilities and similar data will be available for inspection at the office of the Base Civil Engineer (BCE) upon request.

Utility lines and structures indicated on figures provided by the MIANG shall be protected by the Contractor from any damage as a result of his operations. The Contractor will obtain a digging permit from the office of the Base Civil Engineer and contact MISS DIG or the individual utility companies to locate and mark all utilities before excavation begins. The Contractor shall use all available measures to verify the actual field location of all utilities in the proposed work area, including review of applicable Base facilities information. The Contractor shall report his findings to the Contracting Officer or his authorized representative. The Contractor shall notify the Contracting Officer or his authorized representative of any discrepancies, variations, etc. The Contractor will work in conjunction with the Contracting Officer or his authorized representative to field locate the utilities by hand excavation or other exploratory measures. The Contractor shall bear the cost of repair or other exploratory measures. The Contractor shall bear the cost of repair or replacement of any utility lines or structures which are shown on the figures or otherwise made known to the Contractor which are broken or damaged by his operations.

The Contractor is required to make arrangements with the Contracting Officer or his authorized representative for permission to visit the work area and verify quantities (if needed) prior to completing his proposal package.

3.2 INFORMATION ON BIOREMEDIATION SYSTEM

The objective will be to design a system capable of reducing the petroleum hydrocarbon levels in the soil to below state clean-up action levels and to stabilize the lead by means of lime induction within fifteen (15) months. The Michigan Environmental Response Act (MERA) is the statutory authority for activities in the state which do not fall under federal Superfund (CERCLA, NCP) statutory authority. Public Act 307 establishes soil clean up standards.

3.3 WORK UNDER THIS PROJECT

The Contractor shall furnish all labor, materials, equipment, temporary offices, facilities and utilities, to perform, but not limited to, the following:

o Design and construct (install) a bioremediation system.

o Provide for all applicable permits, manifests and licenses.

o Remove and dispose of the concrete pad and piping at Site 4 in a proper manner.

o Perform all work in a manner to satisfy standard codes and local and State requirements.

o Restore all work areas to original or better condition.

o Perform all work in a good workmanlike manner according to standard industry practice.

o Provide for a safe work site at all times.

o In response to the request for proposal, The Contractor shall describe by specific item, how the project as proposed will comply with the regulatory requirements identified in Section 3.4, paragraph 2 of this RFP. Including but not limited to:

oo For proposals relying on cultured microbes, provide a detailed description of how the microbes were selected and cultured. The Contractor must demonstrate that the cultured microbes are not pathogenic.

oo Provide an explanation of how a complete characterization of both the background groundwater quality and the groundwater quality at the remediation site will be provided. The study should include an analysis of the potential introduction of microbes into the groundwater and chemical analyses of contaminants, anions, cations, dissolved oxygen, pH, temperature and nutrient levels. NOTE: Existing monitoring wells can be utilized by the Contractor for obtaining samples for analysis.

oo Provide a site monitoring plan. The monitoring plan should:

(1) draw on the hydrological description of the site to determine the optimum placement location for system installation (including a layout of components).

(2) describe the periodic monitoring plan which will determine the progress and completion of the remediation. This will include proposed sampling point identification,

sampling methods and protocols, the frequency of interim sampling actions, project schedule and report outline (IAW Michigan DNR regulations).

(3) provide a work plan explaining the methodology (including sampling, analysis, procedures, etc.) to be followed to confirm the bioremediation project objectives have been met.

(4) describe the final report to be prepared IAW Michigan DNR regulations which will include but not be limited to: a summary of the work accomplished including the procedures, results, a comparison of the results against the clean-up action levels and an evaluation of the results with supporting conclusions.

oo Provide a determination of the nutrient requirements for the contaminant degrading microbes to achieve optimum growth and a complete description of the method used to determine microbe nutrient requirements.

oo Provide a complete description of any additives, including nutrients, used in the process and an assessment of the toxicity of the additives.

oo Provide an evaluation of potential subsurface geochemical reactions and co-solvency effects that might occur as a result of the bioremediation project, including details regarding how the evaluation was made. Measures to prevent adverse subsurface geochemical reactions and co-solvency effects must be discussed in the evaluation.

oo Provide a description of the method used to supply oxygen to aerobic microbes.

oo Provide the results of a hydrogen peroxide stability test if hydrogen peroxide will be used.

oo Provide the expected estimated extent and rate of biodegradation.

oo Provide an estimate of hydrocarbon or air contaminant emissions produced by the bioremediation operations.

o Provide a detailed description of the methodology to be utilized to remediate the lead currently above the state action levels.

o Use stabilized soil to create a concrete lined ditch at Site 2 and provide a conduit valve or similar device to prevent the potential for future contamination of the drainage ditch

o Provide a detailed description of how the wastes generated as part of this project will be handled, analyzed and disposed of.

3.4 REGULATORY REQUIREMENTS

The Contractor shall conduct all work specified herein and all associated work necessary to complete the work in accordance with all Federal, State and local ordinances, codes and regulations including, but not limited to those of the United States Environmental Protection Agency (USEPA) and the Michigan Department of Natural Resources (DNR). Should any regulation, code or ordinance conflict with that of another agency or any requirement specified herein, the more stringent regulation, code ordinance or requirement shall be enforced.

The bioremediation project is being undertaken in accordance with the Source Removal Action Plan, dated June 1994 and the State and Federal Applicable or Relevant and Appropriate Requirements (ARARs) Analysis (AM Appendix B).

3.5 SAFETY REQUIREMENTS

The Contractor shall do whatever work is necessary for safety and shall be solely and completely responsible for conditions of the jobsite, including care and safety of all property and safety of all persons at the jobsite whether or not employed by the Contractor during the Contract period. This requirement shall apply continuously and not be limited to normal working hours and shall apply to all activities both directly and indirectly associated with all work covered by the Contract. These requirements do not supersede, but are in addition to any federal, OSHA (federal and state), state or local regulations. If a conflict occurs between these requirements and current regulations, the more stringent shall apply.

The Contractor shall at all times provide proper facilities for safe access to the work by authorized government officials.

It shall be the responsibility of the Contractor to be familiar with the required health and safety regulations in the performance of this work.

The Contractor shall be required to certify that all Contractor, subcontractor or service personnel entering the work area for the purpose of performing or supervising the removal of potentially hazardous waste; for health, safety, security or administrative purposes; for maintenance; or for any other function have met the training requirements specified by OSHA (29 CFR Part 1910.129[e]). Certification of safety training will be contained in this Document. A Certificate of Training is acceptable documentation.

3.6 PERMITS AND CLEARANCES

The Contractor shall be held responsible for preparing and obtaining all appropriate federal, state or local permits for all activities. The Contractor shall prepare all manifests or shipping papers to handle, dispose, treat and/or transport, including but not limited to, any contaminated excavated soil. Any drawings submitted with permit applications shall be signed off on by a Professional Engineer registered in the State of Michigan.

The Contractor shall be responsible for obtaining the necessary digging permits. The Contractor shall not perform any work in any area until these permits have been obtained and the MIANG utilities have been flagged by MIANG as a requirement of the digging permits. The digging permits and the flagging are approximate only. Contractor shall use all available measures to verify the actual field location of utilities including hand excavation and exploratory excavations.

The Contractor shall provide entrance permit information to the Contracting Officer or his authorized representative ten (10) working days prior to entering MIANG. This information includes names of all personnel, including subcontractors, who are entering MIANG, the dates they will be there and the purpose of the personnel at MIANG. The permit must accompany Contractor or subcontractor(s) personnel at all times while on base and must be shown upon each entry to MIANG.

The Contractor shall submit all necessary, completed permit applications, manifests and licenses to perform the Work specified herein. The Government will sign manifest forms and other forms as appropriate and submit them to the appropriate agencies. Contractor shall make payment of all permit fees.

3.7 DAILY RECORDS

During construction (installation), the Contractor shall maintain a field notebook to record data and observations covering both the Contractor's and all subcontractor's activities. Entries shall be as much detailed as is necessary so that anyone referring to individual activities may reconstruct an accurate description of a particular situation without reliance on memory.

The field notebook shall be bound and shall contain a variety of information including daily entries in waterproof black ink of the date, start and finish time, weather, the number of field personnel by trade designation, number of administrative and supervisory personnel working on the job, major equipment being used, description and status of all work in progress as well as all new work started, location of work that the Contractor is performing, level of personnel protection being used on-site, site safety meeting attendance list, volumes and categories of wastes handled, vehicle log and the signature of the person making the entry. The names of visitors to the work location and the purpose of their visit shall be recorded in the field notebook. The notebook shall be maintained in chronological order and all pages shall be dated and sequentially numbered.

The Contractor shall make the field notebook available for review by the Contracting Officer upon request. The completed bound notebook shall be turned over to the Contracting Officer when all work specified herein is completed.

All measurements made and samples collected shall be recorded. All entries shall be made in black ink and no erasures may be made. If an incorrect entry is made, the information shall be crossed out with a single strike mark and initialed by the recorder.

3.8 PHOTOGRAPHIC AND VIDEO-TAPE RECORDS

Photographs or videotapes of the site conditions will be taken by the Contractor before work at an area commences, during all major phases of the work and at the completion of the work. A copy of the photographs or videotapes will be submitted to the Contracting Officer or his authorized representative within two working days after the shooting. Contractor shall place a standard sized object such as a ruler or other appropriate object next to the item(s) being recorded so that the relative size can be estimated from the photographic or video records. Each picture or tape cassette will be labeled with the date, time, location and identity of the recorder. Should any picture or portion of the video be unclear or obscured, or if an important feature is missing from the photographic records as defined by the Contracting Officer or his authorized representative, the pictures and/or video records will be retaken and re-submitted to the Contracting Officer or his authorized representative within two working days.

3.9 CONSTRUCTION SCHEDULE

The Contractor shall submit for review and approval by the Contracting Officer or his authorized representative a Contract Progress Schedule within five days of initiating work. The schedule should show the major activities of work to be accomplished during the fifteen month Contract performance period. Progress reports for work accomplished must be submitted weekly and will be used by the Contracting Officer to ensure payment for work completed.

3.10 MOBILIZATION AND DEMOBILIZATION

Mobilization shall include all Contractor and subcontractor(s) labor and materials required to transport, assemble and set up on site all Contractor and subcontractor(s) equipment, personnel and other services necessary to perform the Work. Transportation and assembly of equipment necessary to perform the Work during the project are also included under mobilization. Preparation of construction schedules, attendance at meetings and other administrative items are a part of Mobilization. Standby time will not be paid for delays due to Contractor and subcontractor(s) mobilization activities, such as obtaining additional supplies for field use.

Demobilization includes all Contractor and subcontractor(s) labor and materials required to decontaminate, dismantle, package and/or transport from the site all Contractor and subcontractor(s) equipment and personnel, and to complete the site clean-up to the satisfaction of the Contracting Officer or his authorized representative.

3.11 SITE RESTORATION

(See Appendix C)

3.12 SUBMITTALS

The breakdown for the required submittals is presented in Appendix B. Required submittals include, but are not limited to those described in the appendix. Additional information may be required to clarify a submittal.

The Contractor shall submit to the Contracting Officer or his authorized representative for his review and approval five (5) copies of each item to be submitted. Two copies will be returned to the Contractor following review by the Contracting Officer or his authorized representative. If the Contractor requires additional copies to be returned, additional copies must be submitted by the Contractor. All such items required to be submitted for review shall be furnished by and at the expense of the Contractor and any work affected by them shall not proceed without such review. Submittals and their contents shall be properly prepared, identified and transmitted as provided herein or as the Contracting Officer may otherwise direct. Submittal shall be approved before the material or equipment covered by the submittal is delivered to the site.

Unless otherwise stated for a specific item herein, not more than 5 days shall be allowed for the review of submittals, not including the time necessary for delivery or mailing, and shall cause no delay in the Work. Extension of Contract Time will not be

granted because of the Contractor's failure to make timely and correctly prepared and presented submittals with allowance for the checking and review periods.

At the time of submission, the Contractor shall give notice in writing in the submittal of any deviation from the requirements of the request for proposal. The deviations shall be clearly indicated or described including all other changes required to coordinate the Work. The Contractor shall state in writing all variation in costs occasioned by the deviations and his assumption of the cost of all related changes if the deviation is approved.

The Contractor shall deliver submittals by means of dated, signed and sequence numbered transmittals identifying as to initial or resubmittal status, and fully describing the submittal contents. Submittals are not acceptable directly from subcontractors, suppliers or manufacturers. In each transmittal, the Contractor shall state the Government's Project Number, Name and Address of Contractor, Name and Address of subcontractor, manufacturer, supplier or distributor as applicable, Plan Reference and Specification Section, Articles and paragraphs to which the submittal pertains; accompanying data sheets, catalogs and brochures shall be identified in the same manner. Where several types or models are contained in the literature the Contractor shall delete non-applicable portions or specifically indicate which portions are intended and applicable. Submittal transmittals shall fully index all items submitted.

1. Incomplete Submittals, including those not correctly transmitted, not correctly titled and identified, or not bearing the Contractor's review and approval stamp, will be returned to the Contractor without review.

2. Interrelated Submittals. Except where the preparation of a submittal is dependent upon the approval of a prior submittal, all submittals pertaining to the same class or portion of the Work shall be submitted simultaneously.

The approval of submittals shall not relieve the Contractor of responsibility for any revision in resubmittals unless the Contractor has given notice in writing of the deviation or revision at the time of submission or resubmission and written approval has been given to the specific deviation or revision, nor shall any approval relieve the Contractor of responsibility for errors or omissions in the submittals or for the accuracy of dimensions and quantities, the adequacy of connections and the proper and acceptable fitting, execution and completion of the Work.

The Contractor shall make all required corrections and shall resubmit the required number of corrected submittals until approved by the Contracting Officer or his authorized representative. The Contractor shall direct specific attention, in writing to revisions other than the corrections called for on previous submittals, and shall state in writing, all variations in costs and his assumption of the cost related changes. The Contractor shall identify each resubmittal with number of the original submittal followed by consecutive letters starting with "A" for the first resubmittal, "B" for the second resubmittal, etc.

The contractor shall check submittals returned to him for correction.

No Work represented by required submittals shall be purchased or commenced until the applicable submittal has been approved. Work shall conform to the approved submittals and all other requirements of the Contract Documents unless subsequently revised by an appropriate Modification, in which case the Contractor shall prepare and submit revised submittals as may be required. The Contractor shall not proceed

with any related Work which may be affected by the Work covered under submittals until the applicable submittals have been approved, particularly where machinery, equipment, concrete work and the required arrangements and clearances are involved.

SECTION 4

CRITERIA FOR PROPOSAL EVALUATION

Evaluation of the proposals shall be based on the Contractor's experience, the technical merits of the bioremediation system design and the cost. If proposals do not demonstrate sufficient experience, then no further consideration will be made. The technical evaluation will include but not limited to ranking designs for effectiveness at meeting or exceeding the bioremediation system objectives. Cost evaluation will include but not limited to proposal cost and analytical sampling confirmation/report costs.

Prospective proposal packages shall provide sufficient and appropriate information to allow for a complete review of the packages attributes.

The prospective contractors must show a demonstrated ability and technical expertise in the completion of similar or related projects. Contractor must have successfully installed and completed similar systems in the last three years.

APPENDIX A

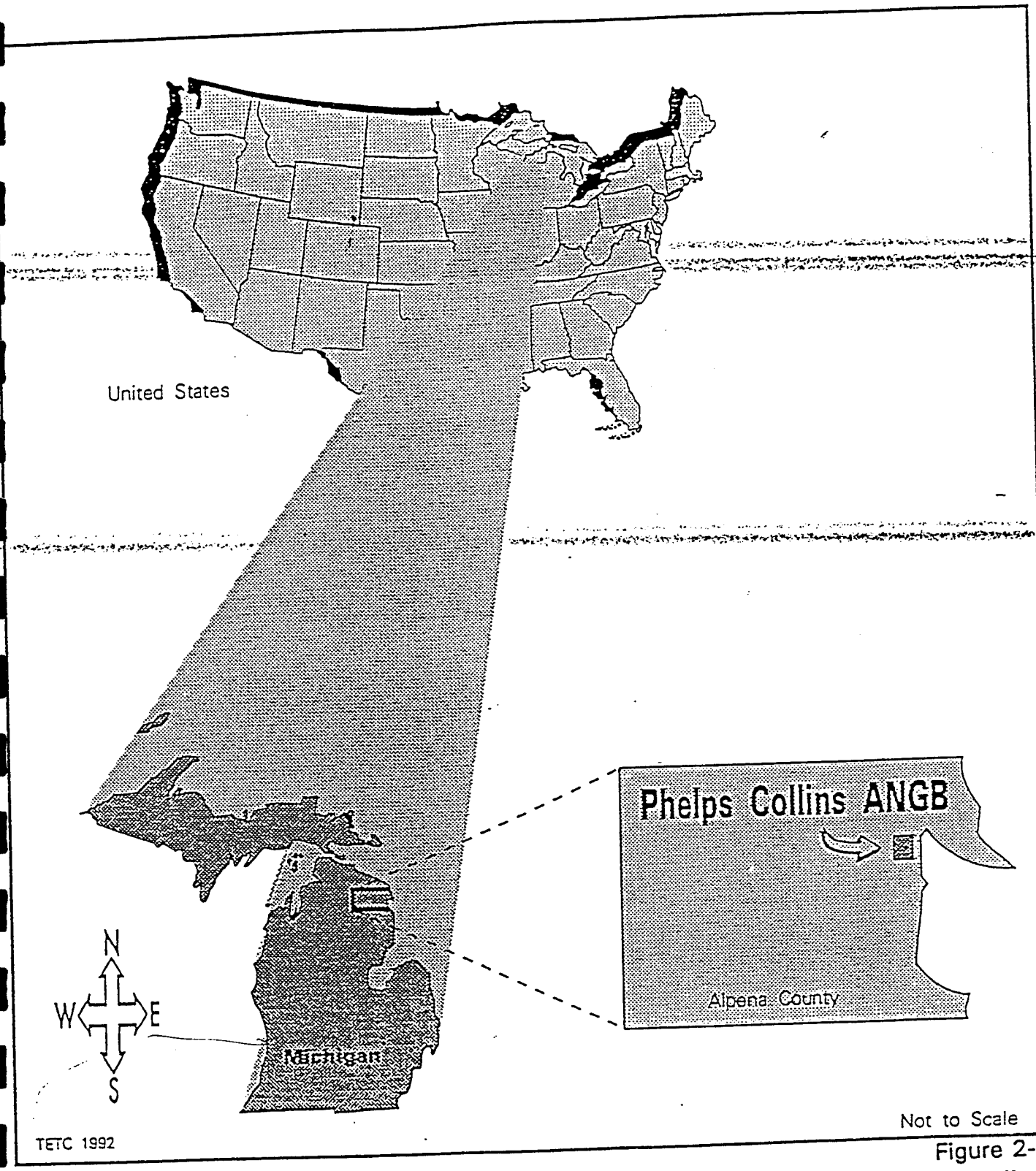
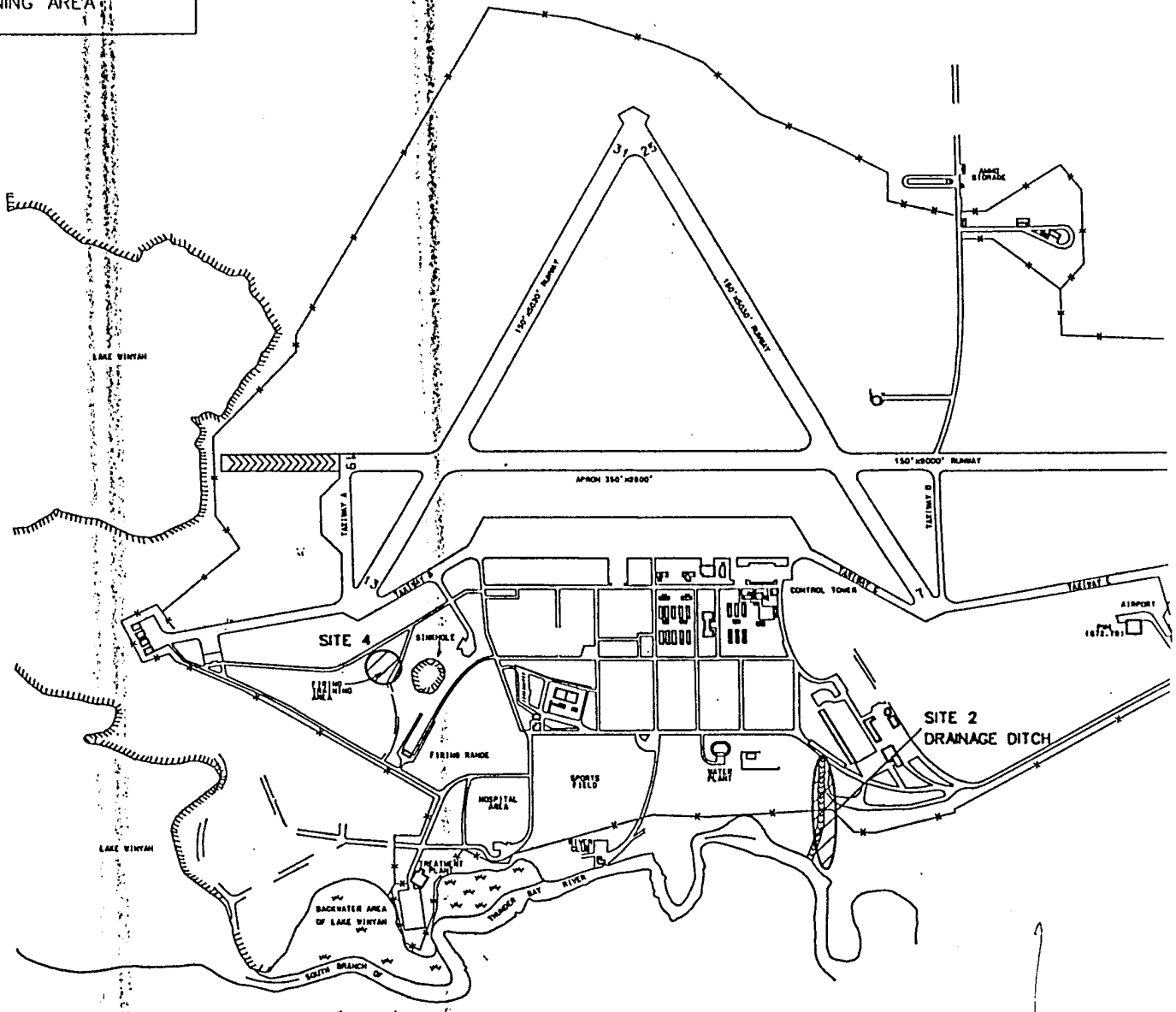


Figure 2-1

Regional Location of Phelps Collins

Alpena CRTC, MIANG, Alpena County Regional Airport, Alpena Michiga

SITE 2 - MOTOR POOL AND DRAINAGE DITCH
SITE 4 - THIRD FIRE TRAINING AREA



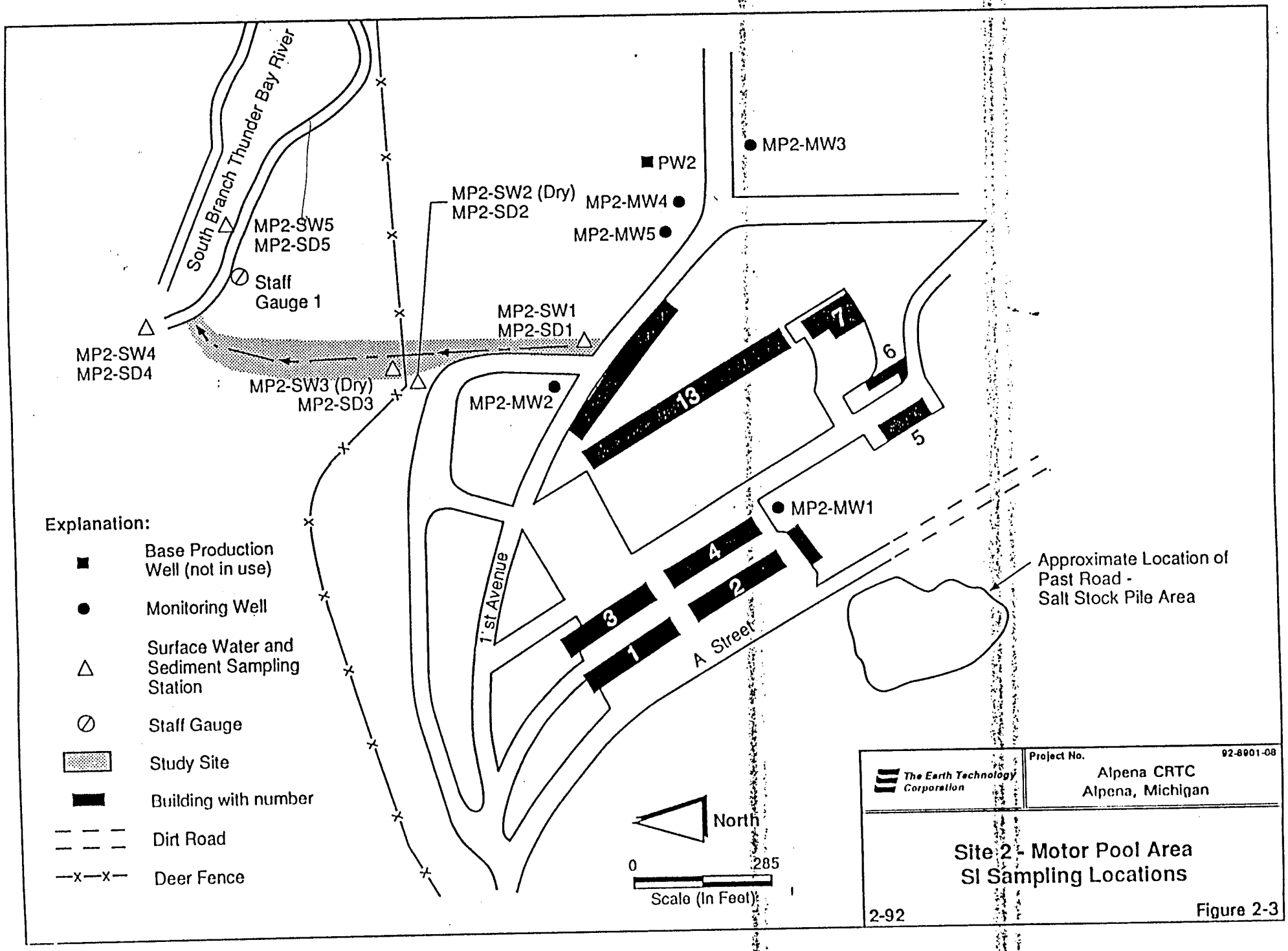

South Branch Thunder Bay River
MP2-SW5
MP2-SD5
Staff
Gauge 1
MP2-SW4
MP2-SD4
MP2-SW3 (Dry)
MP2-SD3
MP2-SW2 (Dry)
MP2-SD2
MP2-SW1
MP2-SD1
PW2
MP2-MW3
MP2-MW4
MP2-MW5
MP2-MW2
MP2-MW1
7
6
13
5
4
2
3
1
1'st Avenue
A Street
Approximate Location of
Past Road -
Salt Stock Pile Area
Explanation:
Base Production Well (not in use)
Monitoring Well
Surface Water and Sediment Sampling Station
Staff Gauge
Study Site
Building with number
Dirt Road
Deer Fence
North
0
285
Scale (In Feet)
The Earth Technology Corporation
Project No. 92-8901-08
Alpena CRTC
Alpena, Michigan
Site 2 - Motor Pool Area
SI Sampling Locations
2-92
Figure 2-3

TABLE 2-1

SITE 2: SUMMARY OF CHEMICAL ANALYSES RESULTS FOR SEDIMENT SAMPLES
ALPENA CRTC, MIANG, ALPENA COUNTY AIRPORT
ALPENA, MICHIGAN

Site: Locator: Depth: Lab Name: Date:	PC-MP2 SD1 09-30-87		PC-MP2 SD2 09-30-87		PC-MP2 SD3 10-01-87		PC-MP2 SD4 10-01-87		PC-MP2 SD5 10-01-87	
	Results	Units	Results	Units	Results	Units	Results	Units	Results	Units
TPH, 418.1	460	mg/kg	23	mg/kg	59	mg/kg	9.7	mg/kg	ND	mg/kg
Metals - SW846										
Be	0.05	mg/kg	0.06	mg/kg	0.26	mg/kg	0.06	mg/kg	0.05	mg/kg
Cd	0.87	mg/kg	ND	mg/kg	0.76	mg/kg	ND	mg/kg	ND	mg/kg
Cr	2.8	mg/kg	1.6	mg/kg	4.5	mg/kg	1.5	mg/kg	1.3	mg/kg
Cu	5.0	mg/kg	1.4	mg/kg	5.1	mg/kg	0.85	mg/kg	0.91	mg/kg
Ni	2.5	mg/kg	2.2	mg/kg	3.8	mg/kg	1.6	mg/kg	1.5	mg/kg
Zn	33.0	mg/kg	110.0	mg/kg	150.0	mg/kg	15.0	mg/kg	2.4	mg/kg
As	1.0	mg/kg	0.15	mg/kg	0.55	mg/kg	1.4	mg/kg	0.29	mg/kg
Pb	29.0	mg/kg	5.6	mg/kg	48.0	mg/kg	0.98	mg/kg	0.85	mg/kg
VOCs 8010/8020										
Ethylbenzene	ND	ug/kg	ND	ug/kg	ND	ug/kg	ND	ug/kg	ND	ug/kg
Toluene	ND	ug/kg	ND	ug/kg	ND	ug/kg	ND	ug/kg	ND	ug/kg
Benzene	ND	ug/kg	ND	ug/kg	ND	ug/kg	ND	ug/kg	ND	ug/kg
Xylenes	ND	ug/kg	ND	ug/kg	ND	ug/kg	ND	ug/kg	ND	ug/kg

Blank spaces indicate that the element was detected below the CRQL.
* Indicates that the compound was not detected above the practical quantitation limit.

TABLE 2-2a

SITE 4: SUMMARY OF 1987 CHEMICAL ANALYSES RESULTS FOR SOIL SAMPLES
ALPENA CRTC, MIANG, ALPENA COUNTY AIRPORT
ALPENA, MIGHIGAN

Site: Locator: Depth: Lab Name: Date:	PC-TF4 SB1a-SS1 2-6.5 09-30-87		PC-TF4 SB1a-SS2 15-16.5 09-30-87		PC-TF4 SB1a-SS3 25-26.5 09-30-87		PC-TF4 SB2a-SS1 1.5-3 9/22/87		PC-TF4 SB2a-SS2 5-6.5 9/22/87	
	Results	Units	Results	Units	Results	Units	Results	Units	Results	Units
TPH 418.1	3700	mg/kg	2700	mg/kg	14	mg/kg	200	mg/kg	43	mg/kg
Metals SW846										
Be	0.30	mg/kg	0.05	mg/kg	0.06	mg/kg	0.21	mg/kg	0.12	mg/kg
Cd	0.10	mg/kg	ND	mg/kg	ND	mg/kg	ND	mg/kg	ND	mg/kg
Cr	8.6	mg/kg	1.6	mg/kg	1.0	mg/kg	6.4	mg/kg	5.4	mg/kg
Cu	2.6	mg/kg	1.8	mg/kg	2.1	mg/kg	2.0	mg/kg	1.2	mg/kg
Ni	4.4	mg/kg	2.8	mg/kg	2.4	mg/kg	4.6	mg/kg	2.7	mg/kg
Zn	17.0	mg/kg	6.3	mg/kg	4.8	mg/kg	22.0	mg/kg	4.4	mg/kg
As	0.79	mg/kg	0.61	mg/kg	0.77	mg/kg	0.96	mg/kg	0.13	mg/kg
Se	ND	mg/kg	ND	mg/kg	ND	mg/kg	ND	mg/kg	ND	mg/kg
Pb	5.5	mg/kg	1.1	mg/kg	0.84	mg/kg	5.7	mg/kg	0.96	mg/kg
VOCs 8010/8020										
Ethylbenzene	200	ug/kg	370	ug/kg	71	ug/kg	17	ug/kg	ND	ug/kg
Toluene	900	ug/kg	570	ug/kg	240	ug/kg	ND	ug/kg	ND	ug/kg
Benzene	300	ug/kg	24	ug/kg	15	ug/kg	ND	ug/kg	ND	ug/kg
Xylenes	870	ug/kg	800	ug/kg	140	ug/kg	97	ug/kg	ND	ug/kg

TABLE 2-2a (Continued)

SITE 4: SUMMARY OF 1987 CHEMICAL ANALYSES RESULTS FOR SOIL SAMPLES
ALPENA CRTC, MIANG, ALPENA COUNTY AIRPORT
ALPENA, MICHIGAN

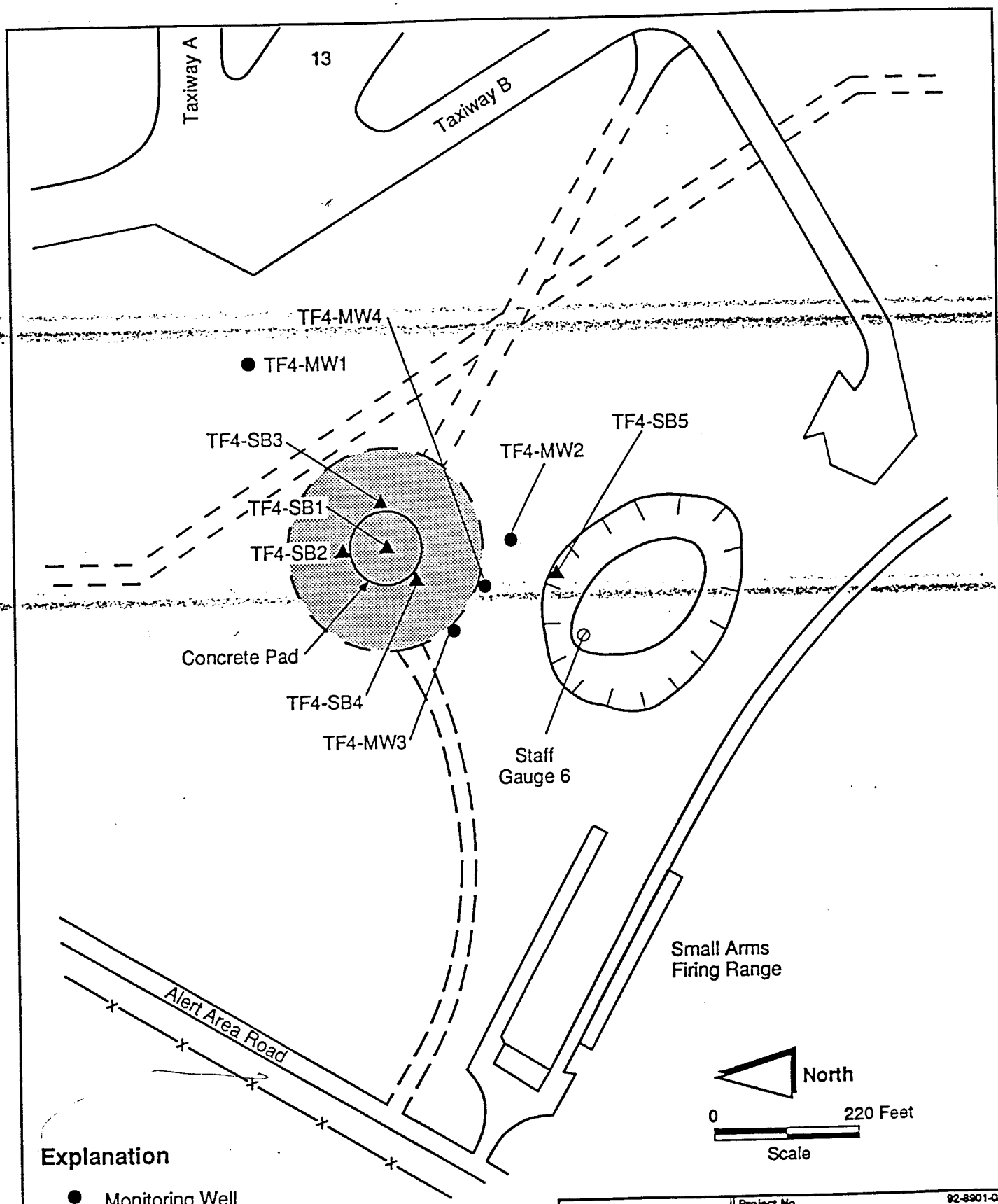
Site:	PC-TF4		PC-TF4		PC-TF4		PC-TF4		PC-TF4	
Locator:	SB3a-SS1		SB3a-SS2		SB4a-SS1		SB4a-SS2		SB5a-SS1	
Depth:	1.5-3		5-6.5		5-6.5		15-16.5		0-4	
Lab Name:										
Date:	09-22-87		09-22-87		09-30-87		9/30/87		11/13/87	
	Results	Units	Results	Units	Results	Units	Results	Units	Results	Units
TPH 418.1	1070	mg/kg	220	mg/kg	410	mg/kg	12	mg/kg	ND	mg/kg
Metals SW846										
Be	0.15	mg/kg	0.11	mg/kg	0.11	mg/kg	0.06	mg/kg	0.08	mg/kg
Cd	ND	mg/kg	ND	mg/kg	ND	mg/kg	ND	mg/kg	ND	mg/kg
Cr	6.6	mg/kg	3.6	mg/kg	2.5	mg/kg	2.3	mg/kg	2.6	mg/kg
Cu	1.7	mg/kg	1.5	mg/kg	4.4	mg/kg	1.8	mg/kg	1.0	mg/kg
Ni	4.5	mg/kg	2.7	mg/kg	3.6	mg/kg	3.2	mg/kg	2.1	mg/kg
Zn	16.0	mg/kg	4.6	mg/kg	11.0	mg/kg	4.9	mg/kg	3.9	mg/kg
As	1.3	mg/kg	1.2	mg/kg	0.95	mg/kg	0.81	mg/kg	0.53	mg/kg
Se	ND	mg/kg	ND	mg/kg	ND	mg/kg	ND	mg/kg	ND	mg/kg
Pb	3.4	mg/kg	1.1	mg/kg	2.8	mg/kg	1.1	mg/kg	1.0	mg/kg
VOCs 8010/8020										
Ethylbenzene	ND	ug/kg	ND	ug/kg	ND	ug/kg	ND	ug/kg	ND	ug/kg
Toluene	ND	ug/kg	ND	ug/kg	ND	ug/kg	ND	ug/kg	ND	ug/kg
Benzene	ND	ug/kg	ND	ug/kg	ND	ug/kg	ND	ug/kg	ND	ug/kg
Xylenes	ND	ug/kg	ND	ug/kg	580	ug/kg	170	ug/kg	ND	ug/kg

TABLE 2-2a (Continued)

SITE 4: SUMMARY OF 1987 CHEMICAL ANALYSES FOR SOIL SAMPLES
ALPENA CRTC, MIANG, ALPENA COUNTY AIRPORT
ALPENA, MIGHICAN

Site: Locator: Depth: Lab Name: Date:	PC-TF4 MW1a-SS1 5 09-18-87		PC-TF4 MW1a-SS2 10 09-18-87	
	Results	Units	Results	Units
TPH 418.1	10	mg/kg	26	mg/kg
Metals SW846				
Be	0.03	mg/kg	0.05	mg/kg
Cd	ND	mg/kg	ND	mg/kg
Cr	0.90	mg/kg	4.5	mg/kg
Cu	0.85	mg/kg	0.66	mg/kg
Ni	1.6	mg/kg	2.8	mg/kg
Zn	6.2	mg/kg	5.6	mg/kg
As	0.51	mg/kg	0.36	mg/kg
Se	0.40	mg/kg	0.31	mg/kg
Pb	6.2	mg/kg	1.2	mg/kg
VOCs 8010/8020				
Ethylbenzene	ND	ug/kg	ND	ug/kg
Toluene	ND	ug/kg	ND	ug/kg
Benzene	ND	ug/kg	ND	ug/kg
Xylenes	ND	ug/kg	ND	ug/kg

Blank spaces indicate that the element was detected below the CROL.
* Indicates that the compound was not detected above the practical quantitation limit.



The Earth Technology Corporation

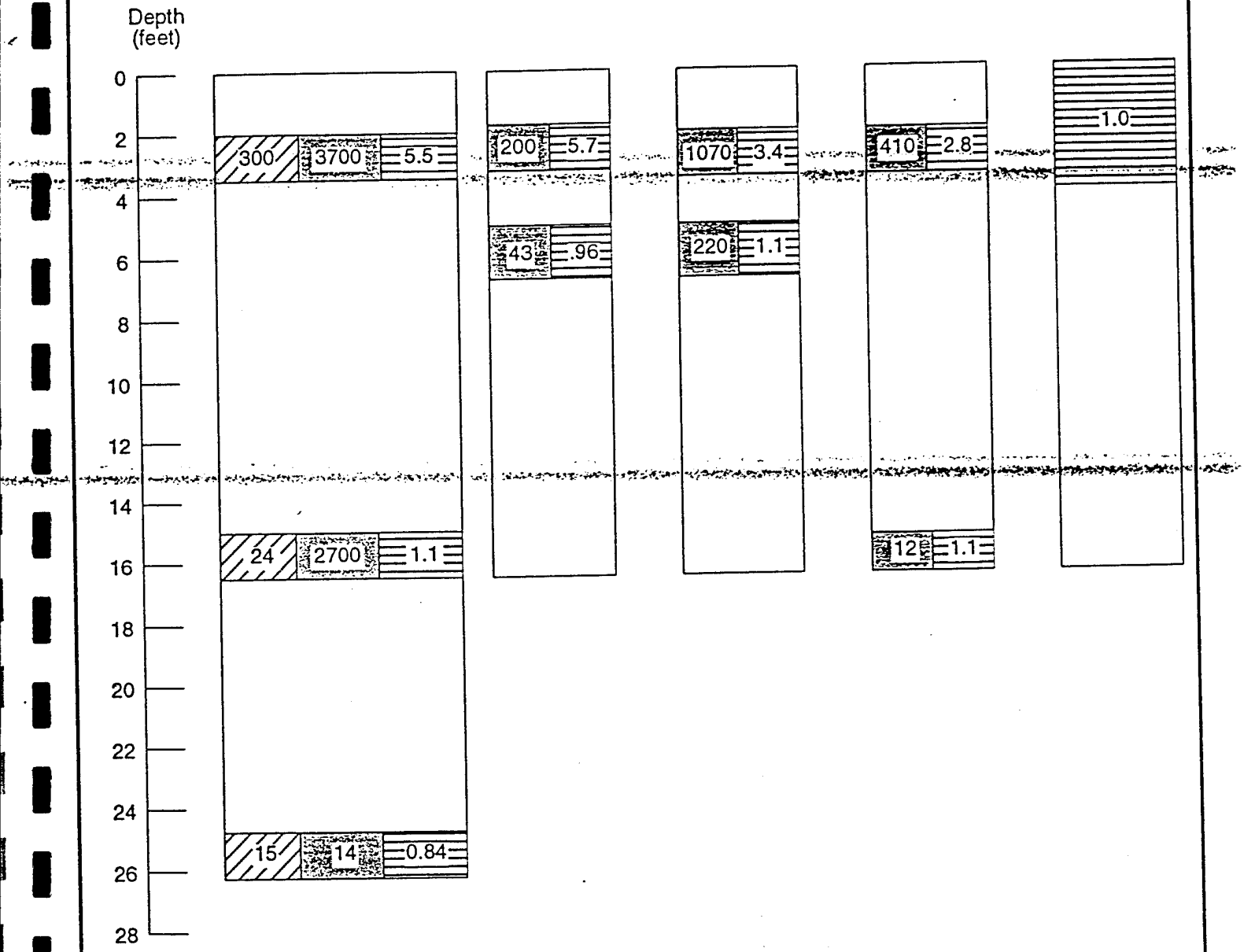
Project No. 92-8901-08

Alpena CRTC
Alpena, Michigan

Site 4 - Third Fire Training Area
SI Sampling Locations

4-92

Figure 2-4



Explanation

TPH (ppm)

Benzene (ppb)

Lead (ppm)

The Earth Technology Corporation®

Project No. 931800

Alpena CRTC
Alpena, Michigan

Concentration of Chemicals of Concern at Site 4 - 1987 Data

4-94

Figure 2-5

931800 Chemical

Table 2-2b

SITE 4: SUMMARY OF 1993 CHEMICAL ANALYSES RESULTS FOR SOIL SAMPLES
ALPENA CRTC, MIANG, ALPENA COUNTY AIRPORT
ALPENA, MICHIGAN

Sample Number: Date: Depth:	P04B50205 1/20/93 2'- 5'	P04B51014 1/20/93 10'- 14'	P04B51620[1] 1/20/93 16'- 20'	P04B52022[1] 1/20/93 20'- 22'	MDNR Cleanup Level
SVOCs: CLP 3/90 ug/kg					
Butylbenzylphthalate	170	100	110	88	22,000
bis(2-ethylhexyl)phthalate	52	40		46	92,000
2-methylnaphthalene					ID
Naphthalene					5,000
Phenanthrene					500
Di-n-butylphthalate					17,000
Fluorene					17,000
TPH (mg/kg) 418.1		114	222	115	

Notes:

Blank spaces indicate the compound was detected below CRQLs
(1) Field duplicate pair
ID - Insufficient Data

Table 2-2b (Continued)

SITE 4: SUMMARY OF 1993 CHEMICAL ANALYSES RESULTS FOR SOIL SAMPLES
ALPENA CRTC, MIANG, ALPENA COUNTY AIRPORT
ALPENA, MICHIGAN

Sample Number:	P04B60205	P04B61014	P04B61620	P04B70205	MDNR Cleanup Level
Date:	1/20/93	1/20/93	1/20/93	1/20/93	
Depth:	2'- 5'	10'- 14'	16'- 20'	2'- 5'	
SVOCs: CLP 3/90 (ug/kg)					
Butylbenzylphthalate	71	110	91	90	22,000
bis(2-ethylhexyl)phthalate		280	48		92,000
2-methylnaphthalene				260	ID
Naphthalene				97	5,000
Phenanthrene					500
Di-n-butylphthalate					17,000
Fluorene					17,000
TPH 418.1 (mg/kg)	99.1	163	145	257	

Notes:
Blank spaces indicate compound detected below CROLs
ID - Insufficient Data

Table 2-2b (Continued)

SITE 4: SUMMARY OF 1993 CHEMICAL ANALYSES RESULTS FOR SOIL SAMPLES
ALPENA CRTC, MIANG, ALPENA COUNTY AIRPORT
ALPENA, MICHIGAN

Sample Number:	P04B71014	P04B71620	P04B80205	P04B81014	MDNR Cleanup Level
Date:	1/20/93	1/20/93	1/20/93	1/20/93	
Depth:	10'- 14'	16'- 20'	2'- 5'	10'- 14'	
SVOCs: CLP 3/90 (ug/kg)					
Butylbenzylphthalate	84		140 B	130 B	22,000
bis(2-ethylhexyl)phthalate	72			52 J	92,000
2-methylnaphthalene	2800	26000			ID
Naphthalene	200	11000			5,000
Phenanthrene	140	540			500
Di-n-butylphthalate	40				17,000
Fluorene	230	730			17,000
TPH 418.1 (mg/kg)	2300	9160	46.6	156	

Notes:

Blank spaces indicate the compound was detected below CRQLs
ID - Insufficient Data. No MDNR cleanup level promulgated
B - Blank contamination
J - estimated value

Table 2-2b (Continued)

SITE 4: SUMMARY OF 1993 CHEMICAL ANALYSES RESULTS FOR SOIL SAMPLES
ALPENA CRTC, MIANG, ALPENA COUNTY AIRPORT
ALPENA, MICHIGAN

Sample Number:	P04B81416[1]	P04B81620[1]	P04B90205	P04B91014	MDNR Cleanup Levels
Date:	1/20/93	1/20/93	1/20/93	1/20/93	
Depth:	14'- 16'	16'- 20'	2'- 5'	10'- 14'	
SVOCs: CLP 3/90 (ug/kg)					
Butylbenzylphthalate	160 B	140 B	220 B	94 B	22,000
bis(2-ethylhexyl)phthalate					92,000
2-methylnaphthelane					ID
Naphthalene					5,000
Phenanthrene					500
Di-n-butylphthalate					17,000
Fluorene					17,000
TPH 418.1 (mg/kg)	113	110	206	220	

Notes:

Blank spaces indicate compound was detected below CRQLs
(1) Field duplicate pair
ID - Insufficient Data
B - Blank contamination

Table 2-2b (Continued)

SITE 4: SUMMARY OF 1993 CHEMICAL ANALYSES RESULTS FOR SOIL SAMPLES
ALPENA CRTC, MIANG, ALPENA COUNTY AIRPORT
ALPENA, MICHIGAN

Sample Number:	P04B91620	P4B100206	P4B101014	P4B101620	MDNR Cleanup Levels
Date:	1/20/93	1/20/93	1/20/93	1/20/93	
Depth:	16'- 20'	2'- 6'	10'- 14'	16'- 20'	
SVOCs:					
Butylbenzylphthalate	150 B	110 B	140	89	22,000
bis(2-ethylhexyl)phthalate	53 J	36 J			92,000
2-methylnaphthalene					ID
Naphthalene					5,000
Phenanthrene			43		500
Di-n-butylphthalate					17,000
Fluorene					17,000
TPH	233	58.7	98.6	91.9	

Notes:

Blank spaces indicate compound detected below CRQLs
ID - Insufficient Data
B - Blank contamination
J - Estimated value

Table 2-2b (Continued)

SITE 4: SUMMARY OF 1993 CHEMICAL ANALYSES RESULTS FOR SOIL SAMPLES
ALPENA CRTC, MIANG, ALPENA COUNTY AIRPORT
ALPENA, MICHIGAN

Sample Number:	P4B110205	P4B111014	P4B111620[1]	P4B112022[1]	MDNR Cleanup Level
Date:	1/20/93	1/20/93	1/20/93	1/20/93	
Depth:	2'- 5'	10'- 14'	16'- 20'	20'- 22'	
SVOCs: CLP 3/90 ug/kg					
Butylbenzylphthalate	140 B	110 B	310 B	510 B	22,000
bis(2-ethylhexyl)phthalate					92,000
2-methylnaphthalene					ID
Naphthalene					5,000
Phenanthrene					500
Di-n-butylphthalate					17,000
Fluorene					17,000
TPH 418.1	36.6	74.6	61.9	74.6	

Notes:

Blank spaces indicate compound detected below CROLs
(1) Field duplicate pair
ID - Insufficient Data

2.3 REMOVAL ACTION JUSTIFICATION

Based upon a review of the SI report the ANGRC identified the soil operable units of Sites 2 and 4 as potential candidates for removal actions. The results of the investigations completed at Sites 2 and 4 were presented in Section 2.2. The results of the investigations revealed the following:

Site 2 - Drainage Ditch from Motor Pool Area

- Lead was identified in the drainage ditch sediment above ARARs.
- No analysis of semivolatile compounds has occurred at Site 2. TPH concentrations above 100 ppm were detected. A TPH concentration of above 100 ppm was used as a indicator for clean-up action. However, the MNDR does not have a clean-up criteria for TPH.
- No risk evaluation is possible due to a lack of health effects data for TPH and lead.
- The drainage ditch may act as a transport pathway to Thunder Bay River. Potential receptors are Base personnel and recreational users.

Site 4 - Third Fire Training Area

- Benzene subsurface soil contamination above ARARs was identified in the shallow (6.5 feet) and deep (16.5 feet) soil intervals.
- 2-methylnapthalene and naphthalene were identified at levels above ARARs to a depth of 20 feet.
- Soils borings along the pipeline used to pump fuel into the FTA indicated bis(2-ethylhexyl)phthalate (in the 10 foot to 14 foot interval) and TPH through the 20 foot interval above ARARs.
- No contaminants were detected in the shallow groundwater.
- The soil is a potential pathway for contamination of groundwater, surface water, and sediments.

2.4 SOIL VOLUME ESTIMATES

The areal extent and depth of contaminated soil was estimated based upon the analytical results presented in Section 2.2. Specific assumptions were made for each site and are discussed in the following sections.

The volume estimates presented here are based on current available information. Consequently, the actual volumes may vary depending on the results of the field sampling carried out in conjunction with the selected removal activity.

2.4.1 Site 2 - Motor Pool Area (drainage ditch operable unit)

Estimates were made regarding the physical dimensions of the drainage ditch. No data were collected during the SI regarding depth of contamination; however, it is assumed that the contaminants in this area were deposited by erosion, resulting in shallow contamination depths. The ditch is estimated to be 20 feet wide with a vertical depth of 1 foot. Based on the existing data, the length of the ditch requiring remediation for TPH is estimated to be 150 feet, while the length for removal of lead is estimated at 430 feet. The removal volume for lead includes all of the soil treated for TPH contamination along with an additional 280 feet of ditch which requires removal of metals only. The in-place volume of soil requiring TPH removal is estimated to be approximately 3000 cubic feet or 111 cubic yards. The in-place soil volume requiring metals removal is estimated to be 8600 cubic feet or 319 cubic yards.

2.4.2 Site 4 - Third Fire Department Training Area

The analytical results obtained from soil boring SB1 at 26 feet indicated that the concentration of contaminants of concern at this level was below ARARs. Soil borings around the perimeter of the concrete pad indicated that the vertical extent of contaminant concentrations above ARARs ranged from 1 to 20 feet below the surface. The outer edge of the concrete is assumed to be the extent of horizontal migration. The initial excavation in the area is assumed to be a 165 feet diameter cylinder to 20 feet in depth with an area of 21,382 ft^2, yielding a volume of 15,851 yd^3. Excavation from 20 to 26 feet is assumed to be a cone resulting in a volume of 1,585 yd^3. A depth of 26 feet is estimated as the maximum depth of contamination.

The 1993 sampling results indicated contamination in the area of the pipeline which was used to pump fuel into the FTA. TPH was detected in borings placed along the pipeline. TPH was detected at levels above 100 ppm from 10 to 20 feet. In order to estimate the volume of soil associated with the pipeline, specific assumptions were made. The length of the pipeline is assumed to be 200 feet and the depth of soil requiring remediation is assumed to be 0- to 20-feet. The lateral extent of the contamination is assumed to be 5 feet. The above assumptions result in a volume of 20,000 ft^3 or 740 yd^3 of soil for remediation.

The gully between the FTA and the sinkhole is included as part of the removal area as a precautionary measure since runoff from the FTA traveled through the gully. The dimensions of the eroded gully are estimated to be 80 feet long by 20 feet wide. The depth of excavation is estimated to be 1 foot. The resulting volume for the gully is 1,600 cubic feet or 59 cubic yards. The total volume for Site 4 is 18,235 yd^3.

APPENDIX B

Submittal Requirements

REQUEST FOR PROPOSAL - SUBMITTAL SCHEDULE

Line 1: Company Information
+ Brochures, Experience Record, Job History, etc.

Line 2: Bioremediation System Design (Section 3.2)
+ Conceptual Site Plan showing proposed layout
+ Description of how microbes will be selected
+ Description of how lead will be stabilized
+ Description of how wastes generated will be handled
+ Conceptual Site Monitoring Plan
+ Equipment Information and Specifications

Line 3: Itemized Cost Breakdown of Lump Sum Price
+ Unit costs (by division of labor and materials) for system installation
+ Unit costs for periodic and final testing and report

Line 4: Proposed Construction Schedule (including installation and monitoring)

Line 5: Certification of Training (OSHA 29 CFR 1910.120 [e]) (Section 3.5)

FINAL APPROVALS/CONSTRUCTION - SUBMITTAL SCHEDULE

Line 1: Bioremediation System Design (Section 3.2)
+ Final Site Plan showing layout and location of system
+ Description of how microbes were selected/cultured
+ Description of how lead will be remediated to meet MDNR action levels
+ Final Site Monitoring Plan
+ Final Equipment and Material Specifications

Line 2: Proposed Analytical Laboratory

Line 3: Contract Progress Schedule (Section 3.9)

Line 4: Additional Design Information (Section 3.3)
+ Groundwater quality assessment/evaluation
+ Nutrient requirements
+ Additives Description
+ Evaluation of potential subsurface geochemical reactions and co-solvency effects
+ Description of the method for oxygen supply
+ Hydrogen peroxide stability test (if required)
+ Emissions estimate

Line 5: Contract Progress Report (Section 3.9)

Line 6: Pre-Construction Photos (Section 3.8)

Line 7: Construction Photos (Section 3.8)

Line 8: Post-Construction Photos (Section 3.8)

Line 9: Field Notebook (Section 3.7)

Line 10: Permits, Manifests, Licenses (Section 3.4 and 3.6)

Line 11: Periodic Analytical Results Report

Line 12: Final Analytical Report

3.0 IDENTIFICATION OF REMOVAL ACTION OBJECTIVES

The removal action objectives for Site 2 and Site 4 are presented in this section. The purpose, scope, and schedule for implementation of selected alternatives are discussed. ARARs and clean-up goals are presented.

3.1 REMOVAL ACTION OBJECTIVES

Removal actions are intended to attain or exceed the ARARs of the Federal and State of Michigan environmental and public health laws. Removal actions are intended to be consistent with any remedial actions which might be initiated at a later date. The ARARs for the three sites are discussed in the following sections.

3.2 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The selection of ARARs is dependent on the site characteristics, location, and remedial alternative selected. ARARs can be subdivided into three specific categories: chemical-specific, location-specific, and action-specific.

3.2.1 Chemical-Specific ARARs

Chemical-specific requirements set health or risk-based concentration limits or discharge limitations in various environmental media for specific hazardous substances, pollutants, or contaminants. These requirements generally set protective cleanup levels for the chemicals of concern in the designated media, or indicate a safe level of discharge that may occur during a remedial activity.

The first step in the public health evaluation is the selection of chemicals of concern. This procedure identifies the chemicals that pose the greatest potential public health risk at a site and is based on the site monitoring data, chemical toxicity information, and environmental persistence and mobility characteristics of the chemicals.

A list of chemicals of concern was developed by Earth Technology based upon the history of operations at Phelps Collins and the results of the previous investigations. The chemicals of concern identified for Sites 2 and 4 include 2 methylnapthalene, naphthalene, TPH (as an indicator of contamination only), benzene, lead, and arsenic.

The Michigan Environmental Response Act (MERA) is the statutory authority for activities in the state which do not fall under federal Superfund (CERCLA, NCP) statutory authority. Under MERA (1982 PA 307, as amended, Section 7) cleanup criteria for soil and groundwater have been promulgated. Act 307 assigns three potential types of cleanup criteria: Type A, Type B, and Type C. Type A criteria direct cleanup of the site to background levels or analytical method detection limits. Type B criteria are health-based levels and can be below method

detection limits. Type C criteria are based on site-specific risk assessment characteristics. MERA allows the responsible parties to propose a combination of Types A, B, or C to form an acceptable removal action plan.

Act 307 Type A criteria currently allow the cleanup criteria of metals to be based on local background levels or to acceptable default values. The Type A default criteria values are based on analysis of the Michigan Background Soil Survey (April 1991) and were established by the MDNR in 1993. The Type A default criteria apply to all soil types. Type A default values for chemicals of concern are presented in Table 3-1. Site specific background concentrations higher than the acceptable default values may be established. Background levels for Site 4 were determined as outlined below.

Soil borings and monitoring well logs from Site 4 indicate that the soils consist of fine- to medium- grained quartz sand with and without clay or organic matter. The presence or absence of the clay or organic matter influences the adsorption capacity of the soil. In order to derive background metal concentrations which accurately reflect the nature of the material present at the sites, it was necessary to determine background values for both quartz soils (only) and for quartz soils with organic matter present.

Samples were obtained in the Grayling soil series to determine background metals concentrations representative of the quartz material. These background metal concentrations are indicative of low adsorption capacity soil and represent a minimum background concentration.

Background soil samples obtained from Sites 4 and 7 during the SI were determined to be representative of the metals concentrations which would be seen in quartz soil with some clay or organic matter present. These background metal concentrations are indicative of somewhat higher adsorption capacities than the quartz material alone, but are much less than what would be seen in soils with higher organic content.

Each set of samples was statistically analyzed to eliminate high outliers, as required by the Michigan Department of Natural Resources (MDNR), and a background value was computed. A valid background value consists of a minimum of four samples with the coefficient of variation between sample results less than 0.5. The calculated background value is equal to the mean plus three times the standard deviation. Since there are no distinct soil zones present at the sites, the two background values (one for the quartz and one for quartz with organic matter) were averaged to obtain background metal concentrations.

The calculated background values are presented in Table 3-2. The data used to generate the background concentrations are presented in Table 3-3 and 3-4.

Act 307 Type B criteria for soils allow a soil's leaching characteristics to determine if the metals present a threat to the aquifer. If the soil produces a leachate concentration lower than the highest of the groundwater criteria under Type A or B or the leachate concentration generated by the background soil, the soil is not considered a threat to the aquifer. These criteria are relevant at Site 2 where metals concentrations exceed background and Type A default values. A TCLP analysis of the soil at Site 2 may indicate that no threat to the

Table 3-1 ARARS For Chemicals of Concern
Alpena CRTC, MIANG, Alpena County Regional Airport, Alpena, Michigan

Analyte	Type A Default Criteria (ppb)	Local Background (ppb)	Type B Clean-up Criteria (ppb)
Arsenic	5800	2280	0.4(A)
Lead	21000	7020	80(A)
Benzene			24
2-methylnapthalene			ID
Naphthalene			5,000

A - Type A default or local background may be used
ID - Insufficent data

groundwater (i.e. no leachate concentrations above the Type B criteria of 4 ppb) exists due to the presence of lead. Therefore, lead would not be a contaminant of concern.

3.2.2 Location-Specific ARARs

Location-specific ARARs set restrictions on remedial action activities depending on the characteristics of the site and/or surrounding environments. No location-specific ARARs were applied for this removal action evaluation.

3.2.3 Action-Specific ARARs

Action-specific ARARs are usually technology or activity based requirements of limitations taken with respect to hazardous wastes. Table 3-5 presents the preliminary list of federal and state action-specific ARARs.

3.3 REMOVAL ACTION SCOPE AND SCHEDULE

Previous site investigations have identified surface and subsurface chemicals of concern for each site. The removal action objectives for the soil operable unit are: (1) to prevent migration of chemicals, (2) to remove sources of contamination, and (3) to remediate the site to the levels specified by the most stringent ARARs.

A schedule for implementation of selected alternatives has not been determined at this time.

Table 3-2 Background Metal Concentrations for Site 4

	Quartz Only (ppm)	Quartz with Clay (ppm)	Background Value (ppm)
Arsenic	2.16	2.4	2.3
Chromium	5.26	8.06	6.66
Lead	4.14	9.9	7.0
Zinc	19.06	8.99	14.03

TABLE 3-3

BACKGROUND DATA FOR QUARTZ/CLAY SOILS
MIANG, CRTC, PHELPS COLLINS AIRPORT
ALPENA, MICHIGAN

Site:	PC-TF4		PC-TF4		PC-LF6		PC-LF6	
Locator:	MW1-SS1		MW1-SS2		MW1-SS1		MW1-SS2	
Depth:	5 Ft		10 Ft		2.5 Ft		10 Ft	
Lab Name:								
Date:	18-Sept-87		18-Sept-87		17-Sept-87		17-Sept-87	
	Results	Units	Results	Units	Results	Units	Results	Units
Beryllium	0.03	mg/kg	0.05	mg/kg	0.24	mg/kg	0.27	mg/kg
Chromium	9.0	mg/kg	4.5	mg/kg	3.6	mg/kg	9.8	mg/kg
Copper	0.85	mg/kg	0.66	mg/kg	0.78	mg/kg	1.3	mg/kg
Nickel	1.6	mg/kg	2.8	mg/kg	2.4	mg/kg	1.9	mg/kg
Zinc	6.2	mg/kg	5.6	mg/kg	3.1	mg/kg	3.9	mg/kg
Arsenic	0.51	mg/kg	0.36	mg/kg	1.3	mg/kg	1.5	mg/kg
Selenium	0.40	mg/kg	0.31	mg/kg	2.0	mg/kg	1.5	mg/kg
Lead	6.2	mg/kg	1.2	mg/kg	4.3	mg/kg	5.3	mg/kg

TABLE 3-4

SOIL BACKGROUND DATA FOR QUARTX SOIL
ALPENA CRTC, MIANG, ALPENA COUNTY AIRPORT
ALPENA, MICHIGAN

Site:	PC-BG1				PC-BG1				PC-BG1				PC-BG1			
Locator:	SB1				SB1				SB1				SB2			
Collect Date:	17-OCT-91				17-OCT-91				17-OCT-91				17-OCT-91			
Depth:	0 Inches-6 Inches				12 Inches-18 Inches				24 Inches-30 Inches				12 Inches-18 Inches			
Lab Name:	CompuChem Labs				CompuChem Labs				CompuChem Labs				CompuChem Labs			
Station Number:	PC-BG1-SB1-SS06				PC-BG1-SB1-SS12-18				PC-BG1-SB1-SS24-30				PC-BG1-SB2-SS12-18			
	Result	Qualifier	DL	Units	Result	Qualifier	DL	Units	Result	Qualifier	DL	Units	Result	Qualifier	DL	Units
Methylene Chloride	26	B	3.1	ug/kg	34	B	3.1	ug/kg	23	B	3.1	ug/kg	26	B	3.1	ug/kg
Butylbenzylphthalate	0	U	380	ug/kg	0	U	350	ug/kg	0	U	340	ug/kg	160	B	360	ug/kg
Diethyl phthalate	0	U	380	ug/kg	0	U	350	ug/kg	0	U	340	ug/kg	0	U	360	ug/kg
bis(2-Ethylhexyl)phthalate	44	B		ug/kg	0	U	350	ug/kg	39	B	340	ug/kg	39	J	360	ug/kg
Aluminum	755			mg/kg	4400			mg/kg	2070			mg/kg	5130			mg/kg
Arsenic	1.9			mg/kg	[0.61]			mg/kg	[0.71]			mg/kg	[0.65]			mg/kg
Barium	[9]			mg/kg	[10]			mg/kg	[2.8]			mg/kg	[11.2]			mg/kg
Beryllium	0	U	0.12	mg/kg	0	U	0.11	mg/kg	0	U	0.1	mg/kg	0	U	0.11	mg/kg
Calcium	[492]	J		mg/kg	[223]	J		mg/kg	[139]	J		mg/kg	[336]	J		mg/kg
Chromium	1.4			mg/kg	3.4			mg/kg	2.9			mg/kg	3.7			mg/kg
Cobalt	0	U	0.58	mg/kg	[1.2]			mg/kg	[1]			mg/kg	[1.2]			mg/kg
Copper	[1.6]	K		mg/kg	[1.1]	K		mg/kg	[0.75]	K		mg/kg	3.9	K		mg/kg
Iron	688			mg/kg	2750			mg/kg	1960			mg/kg	3210			mg/kg
Lead	3.5			mg/kg	1.5			mg/kg	0.89			mg/kg	2.8			mg/kg
Magnesium	[89.2]			mg/kg	[330]			mg/kg	[356]			mg/kg	[318]			mg/kg
Manganese	43.2			mg/kg	12			mg/kg	19.5			mg/kg	30			mg/kg
Nickel	0	U	0.93	mg/kg	[2.7]			mg/kg	[2.2]			mg/kg	[3.2]			mg/kg
Potassium	[381]	B		mg/kg	[104]			mg/kg	0	U	75.5	mg/kg	[106]			mg/kg
Selenium	1.1			mg/kg	0	U	0.32	mg/kg	0	U	0.31	mg/kg	0	U	0.33	mg/kg
Sodium	[54.5]	B		mg/kg	[46.5]	B		mg/kg	[42.7]	B		mg/kg	[52.7]	B		mg/kg
Thallium	[0.86]			mg/kg	0	U	0.21	mg/kg	0	U	0.21	mg/kg	0	U	0.22	mg/kg
Vanadium	[1.6]			mg/kg	[5.2]			mg/kg	[4.1]			mg/kg	6.7			mg/kg
Zinc	6.3	J		mg/kg	4.7	J		mg/kg	3.1	J		mg/kg	8.8	J		mg/kg
Total Petroleum Hydrocarbons	130		25	mg/kg	0	U	25	mg/kg	0	U	25	mg/kg	0	U	25	mg/kg

Only those analytes which were positively detected in one or more samples are shown
Key to Qualifiers:
B - Blank Contamination
U- Non Detect
J-Result estimated
[]- Result between Contract Required Detection Limit and Instrument Detection Limit
UJ-Quantitation Limit Estimated
UL- Quantitation Limit Biased Low

version 001/PC_BG1/(142)

TABLE 3-4 (Continued)

SOIL BACKGROUND DATA FOR QUARTX SOIL
ALPENA CRTC, MIANG, ALPENA COUNTY AIRPORT
ALPENA, MICHIGAN

Site:	PC-BG1				PC-BG1				PC-BG1				PC-BG1			
Locator:	SB2				SB2				SB2				SB3			
Collect Date:	17-OCT-91				17-OCT-91								17-OCT-91			
Depth:	24 Inches-30 Inches				12 Inches-18 Inches				0 Inches-6 Inches				0 Inches-6 Inches			
Lab Name:	CompuChem Labs				CompuChem Labs				CompuChem Labs				CompuChem Labs			
Station Number:	PC-BG1-SB2-SS24-30				PC-BG1-SB2-SS12-18RE*				PC-BG1-SB2-SS06				PC-BG1-SB3-SS06			
	Result	Qualifier	DL	Units	Result	Qualifier	DL	Units	Result	Qualifier	DL	Units	Result	Qualifier	DL	Units
Methylene Chloride	20	B	3.1	ug/kg					38	B	3.1	ug/kg	32	B	3.1	ug/kg
Butylbenzylphthalate	130	B		ug/kg	0	U	350	ug/kg	92	B		ug/kg	160	B		ug/kg
Diethyl phthalate	0	U	350	ug/kg	70			ug/kg	0	U	420	ug/kg	0	U	360	ug/kg
bis(2-Ethylhexyl)phthalate	0	U	350	ug/kg	170	B		ug/kg	43	J		ug/kg	0	U	360	ug/kg
Aluminum	3730			mg/kg					1350			mg/kg	4480			mg/kg
Arsenic	[0.81]			mg/kg					1.7			mg/kg	[0.82]			mg/kg
Barium	[8.3]			mg/kg					[19.7]			mg/kg	[7.6]			mg/kg
Beryllium	0	U	0.11	mg/kg					0	U	0.13	mg/kg	0	U	0.11	mg/kg
Calcium	[217]	J		mg/kg					1240	J		mg/kg	[184]	J		mg/kg
Chromium	3.3			mg/kg					1.7			mg/kg	2.9			mg/kg
Cobalt	[0.82]			mg/kg					0	U	0.65	mg/kg	[1.2]			mg/kg
Copper	[0.85]	K		mg/kg					[2.8]	K		mg/kg	[0.91]	J		mg/kg
Iron	2660			mg/kg					1100			mg/kg	2970			mg/kg
Lead	1.7			mg/kg					13.8			mg/kg	1.5			mg/kg
Magnesium	[315]			mg/kg					[156]			mg/kg	[175]			mg/kg
Manganese	28.4			mg/kg					99.6			mg/kg	22.1			mg/kg
Nickel	[2.1]			mg/kg					[1.1]			mg/kg	[1.9]			mg/kg
Potassium	[77.7]			mg/kg					[202]			mg/kg	[124]			mg/kg
Selenium	0	U	0.32	mg/kg					0	U	0.39	mg/kg	0	U	0.32	mg/kg
Sodium	[51.1]	B		mg/kg					[57.1]	B		mg/kg	[47.3]	B		mg/kg
Thallium	0	U	0.21	mg/kg					0	U	0.26	mg/kg	0	U	0.22	mg/kg
Vanadium	5.4			mg/kg					[2.5]			mg/kg	5.8			mg/kg
Zinc	10.9	J		mg/kg					13.9	J		mg/kg	4.3	J		mg/kg
Total Petroleum Hydrocarbons	0	U	25	mg/kg					210		25	mg/kg	0	U	25	mg/kg

Only those analytes which were positively detected in one or more samples are shown
* Repeat analysis for semi-volatiles only
Key to Qualifiers:
B - Blank Contamination
U- Non Detect
J-Result estimated
[]- Result between Contract Required Detection Limit and Instrument Detection Limit
UJ-Quantitation Limit Estimated
UL- Quantitation Limit Biased Low

version 001/PC_BG1/(142)

TABLE 3-4 (Continued)

SOIL BACKGROUND DATA FOR QUARTX SOIL
ALPENA CRTC, MIANG, ALPENA COUNTY AIRPORT
ALPENA, MICHIGAN

Site:	PC-BG1				PC-BG1				PC-BG1				PC-BG1			
Locator:	SB3				SB3				SB4				SB4			
Collect Date:	17-OCT-91				17-OCT-91				17-OCT-91				17-OCT-91			
Depth:	12 Inches-18 Inches				24 Inches-30 Inches				12 Inches-18 Inches				24 Inches-30 Inches			
Lab Name:	CompuChem Labs				CompuChem Labs				CompuChem Labs				CompuChem Labs			
Station Number:	PC-BG1-SB3-SS12-18				PC-BG1-SB3-SS24-30				PC-BG1-SB4-SS12-18				PC-BG1-SB4-SS24-30			
	Result	Qualifier	DL	Units	Result	Qualifier	DL	Units	Result	Qualifier	DL	Units	Result	Qualifier	DL	Units
Methylene Chloride	32	B	3.1	ug/kg	17	B	3.1	ug/kg	13.4	B	3.1	ug/kg	15	B	3.1	ug/kg
Butylbenzylphthalate	0	U	340	ug/kg	0	U	340	ug/kg	0	U	340	ug/kg	83	BJ	340	ug/kg
Diethyl phthalate	270	B		ug/kg	0	U	340	ug/kg	0	U	340	ug/kg	0	U	340	ug/kg
bis(2-Ethylhexyl)phthalate	0	U	340	ug/kg	0	U	340	ug/kg	0	U	340	ug/kg	0	U	340	ug/kg
Aluminum	3610			mg/kg	2150			mg/kg	3790			mg/kg	1490			mg/kg
Arsenic	[0.88]			mg/kg	[0.57]			mg/kg	[0.77]			mg/kg	0	U	0.52	mg/kg
Barium	[13]			mg/kg	[3.4]			mg/kg	[8.3]			mg/kg	[3.3]			mg/kg
Beryllium	0	U	0.1	mg/kg	0	U	0.1	mg/kg	[0.1]			mg/kg	0	U	0.1	mg/kg
Calcium	[168]	J		mg/kg	[206]	J		mg/kg	[189]	J		mg/kg	[99.5]	J		mg/kg
Chromium	3.4			mg/kg	2.9			mg/kg	4.2			mg/kg	2.5			mg/kg
Cobalt	[1.3]			mg/kg	[1]			mg/kg	[1.8]			mg/kg	[0.77]			mg/kg
Copper	0.8	K		mg/kg	13.3	K		mg/kg	[1.2]	K		mg/kg	[0.68]	K		mg/kg
Iron	2630			mg/kg	2290			mg/kg	2740			mg/kg	1770			mg/kg
Lead	1.5			mg/kg	0.96			mg/kg	1.4			mg/kg	0.7			mg/kg
Magnesium	[353]			mg/kg	[401]			mg/kg	[399]			mg/kg	[310]			mg/kg
Manganese	13.3			mg/kg	20.2			mg/kg	14.4			mg/kg	23.5			mg/kg
Nickel	[2.4]			mg/kg	[1.5]			mg/kg	[3.9]			mg/kg	[2]			mg/kg
Potassium	0	U	75.9	mg/kg	[105]			mg/kg	0	U	75.9	mg/kg	0	U	75.6	mg/kg
Selenium	0	U	0.31	mg/kg	0	U	0.31	mg/kg	0	U	0.31	mg/kg	0	U	0.31	mg/kg
Sodium	[38.3]	B		mg/kg	[79.2]			mg/kg	[49.6]	B		mg/kg	[45.5]	B		mg/kg
Thallium	0	U	0.21	mg/kg	0	U	0.21	mg/kg	0	U	0.21	mg/kg	0	U	0.21	mg/kg
Vanadium	[5.1]	B		mg/kg	[4.6]	B		mg/kg	5.3			mg/kg	[3.6]			mg/kg
Zinc	3.2	J		mg/kg	14.9	J		mg/kg	3.9	J		mg/kg	3.4	J		mg/kg
Total Petroleum Hydrocarbons	0	U	25	mg/kg	0	U	25	mg/kg	0	U	25	mg/kg	0	U	25	mg/kg

Only those analytes which were positively detected in one or more samples are shown
Key to Qualifiers:
B - Blank Contamination
U- Non Detect
J-Result estimated
[]- Result between Contract Required Detection Limit and Instrument Detection Limit
UJ-Quantitation Limit Estimated
UL- Quantitation Limit Biased Low

version 001/PC_BG1/(142)

TABLE 3-4 (Continued)

SOIL BACKGROUND DATA FOR QUARTX SOIL
ALPENA CRTC, MIANG, ALPENA COUNTY AIRPORT
ALPENA, MICHIGAN

Site:	PC-BG1				PC-BG1				PC-BG1				PC-BG1			
Locator:	SB4				SB-5				SB-5				SB-5			
Collect Date:	17 - OCT- 91				17 - OCT- 91				17 - OCT- 91				17 - OCT- 91			
Depth:	0 Inches-6 Inches				0 Inches-6 Inches				12 Inches-18 Inches				24 Inches- 30 Inches			
Lab Name:	CompuChem Labs				CompuChem Labs				CompuChem Labs				CompuChem Labs			
Station Number:	PC-BG1-SB4-SS06				PC-BG1-SB5-SS06				PC-BG1-SB5-SS12-18				PC-BG1-SB5-SS24-30			
	Result	Qualifier	DL	Units	Result	Qualifier	DL	Units	Result	Qualifier	DL	Units	Result	Qualifier	DL	Units
Methylene Chloride	29	B	3.1	ug/kg	NA				NA				NA			
Butylbenzylphthalate	160	BJ		ug/kg	NA				NA				NA			
Diethyl phthalate	0	U	370	ug/kg	NA				NA				NA			
bis(2-Ethylhexyl)phthalate	42	J		ug/kg	NA				NA				NA			
Aluminum	1760			mg/kg	1850			mg/kg	3000			mg/kg	2210			mg/kg
Arsenic	[0.85]			mg/kg	2.9	L		mg/kg	[0.81]	L		mg/kg	1.5	L		mg/kg
Barium	[8.1]			mg/kg	24.6			mg/kg	[6.7]			mg/kg	[3.9]			mg/kg
Beryllium	0	U	0.11	mg/kg	0	U	0.24	mg/kg	0	U	0.21	mg/kg	0	U	0.21	mg/kg
Calcium	[457]	J		mg/kg	2170			mg/kg	0	U	374	mg/kg	0	U	377	mg/kg
Chromium	2			mg/kg	2.5	J		mg/kg	3.8	J		mg/kg	3.6	J		mg/kg
Cobalt	[0.66]			mg/kg	[0.81]			mg/kg	[1.1]			mg/kg	[0.88]			mg/kg
Copper	[0.99]	K		mg/kg	[0.24]			mg/kg	[1.7]			mg/kg	[1.9]			mg/kg
Iron	1530			mg/kg	1740			mg/kg	2240			mg/kg	1980			mg/kg
Lead	2.3			mg/kg	18.7	L		mg/kg	1.4	L		mg/kg	0.77	L		mg/kg
Magnesium	[143]			mg/kg	[248]			mg/kg	[363]			mg/kg	[293]			mg/kg
Manganese	22.2			mg/kg	100			mg/kg	12.5			mg/kg	12.4			mg/kg
Nickel	[1]			mg/kg	0	U	3.6	mg/kg	0	U	3.1	mg/kg	0	U	3.1	mg/kg
Potassium	[112]			mg/kg	[336]			mg/kg	0	U	254	mg/kg	0	U	257	mg/kg
Selenium	0	U	0.33	mg/kg	[0.47]			mg/kg	0	U	0.41	mg/kg	0	U	0.41	mg/kg
Sodium	[53.5]	B		mg/kg	[84.6]			mg/kg	[54.2]			mg/kg	[55.9]			mg/kg
Thallium	0	U	0.22	mg/kg	0	U	0.35	mg/kg	0	UL	0.3	mg/kg	0	UL	0.31	mg/kg
Vanadium	[3.6]			mg/kg	[3.1]			mg/kg	[4.3]			mg/kg	[4.0]			mg/kg
Zinc	4.6	J		mg/kg	22.3	J		mg/kg	6.1	J		mg/kg	14.9	J		mg/kg
Total Petroleum Hydrocarbons	0	U	25	mg/kg	57		25	mg/kg	0	U	25	mg/kg	0	U	25	mg/kg

Only those analytes which were positively detected in one or more samples are shown
Key to Qualifiers:
B - Blank Contamination
U- Non Detect
J-Result estimated
[]- Result between Contract Required Detection Limit and Instrument Detection Limit
UJ-Quantitation Limit Estimated
UL- Quantitation Limit Biased Low
NA - Not Analyzed

version 001/PC_BG1/(142)

TABLE 3-5

PRELIMINARY FEDERAL AND STATE ACTION - SPECIFIC ARARs
ALPENA CRTC, MIANG, ALPENA COUNTY AIRPORT
ALPENA, MICHIGAN

REQUIREMENT	COMMENT
RCRA - 40 CFR Parts 260-161	General Requirements for Handling Hazardous Waste
Part 262	Requirements for Generators
Part 263	Requirements for Transport
Part 264	Requirements for Treatment, Storage, and Disposal
Part 268	Land Ban Regulations
SDWA - Maximum Contaminant Levels 40 CFR Part 141.11, 141.12	Drinking Water Standards
CAA - National Ambient Air Quality 40 CFR Part 50	Air Emissions from Treatment (40 CFR Technologies)
New Source Performance Standards 40 CFR Part 131	
OSHA - Requirements for Workers Engaged in Response or Other Hazardous Waste Operations 29 CFR, Parts 1910.50, .1000, .1200; Part 120	Any Action
DOT - Rules for Transportation of Hazardous Materials (49 CFR Parts 107, 171.1-172.558)	Offsite Disposal
Michigan - Environmental Response Act Act No. 307, as amended	Environmental Contamination Response Activity Requirements
Michigan - Hazardous Waste Management Act No. 64, 299.501	Hazardous Waste Regulations
Michigan - Air Pollution Act Act No. 348 of Public Act 1965	Air Emissions from Treatment Technologies

SDWA - Safe Drinking Water Act
CAA - Clean Air Act
OSHA - Occupational Safety and Health Act
DOT - Department of Transportation Requirement

APPENDIX C

SITE RESTORATION

SITE RESTORATION

PART 1 - GENERAL

1.01 DESCRIPTION

Restoration requirements are specified in this section. Restoration is defined as the correction, by repair or replacement, of utilities, grassed areas, pavement, roads, sidewalks, curbs, and any on-site structures damaged or altered as a result of the Contractor's operations.

1.02 RECORDS

The Contractor, as directed by the Contracting Officer or his authorized representative, is responsible for recording the preconstruction site conditions by photograph or videotape. These recrds shall be used by the Contractor and the Contracting Officer or his authorized representative to ensure that the site has been restored to its preconstruction condition or better.

PART 2 - PRODUCTS

A. Topsoil, reasonably free from subsoil, clay lumps, stones, brush, stumps, roots, litter, and other substances which may be harmful to vegetation or supporting maintenance operations, shall be used.

PART 3 - EXECUTION

3.01 SPECIFICATIONS

A. General: Specifications for seeding are provided herein.

If restoration is required for items not specified in this section, restoration shall be to the condition existing prior to the start of the contract work or better and shall be made to the satisfaction of the Contracting Officer or his authorized representative.

B. Seeding: The Contractor shall reseed any area where the activities have damaged ground cover. Areas to be seeded shall be prepared with a minimum depth of 4 in. of topsoil. The topsoil shall be raked and rolled into an even and uniform layer. Seed shall be of the type most adaptable to the climate and season at the site. The Contractor shall provide sufficient labor and material including, but not limited to, seed, water, fertilizer, and mulch.

B

TECHNICAL MEETING MINUTES

B1

PRE-BID MEETING

RESPONSE TO TECHNICAL QUESTIONS
PRE-BID MEETING - SITES #2 AND #4
JANUARY 9, 1995
ALPENA COMBAT READINESS TRAINING CENTER,
PHELPS COLLINS
ALPENA, MICHIGAN

Question #1: Do you want the remediation to be done in-situ or ex-situ ?
Response: Contractor may propose either in-situ or ex-situ remediation.

Question#2: Has a treatability study been performed demonstrating successful treatment of soils using either in-situ or ex-situ bioremediation ?
Response: No treatability study has been performed using either in-situ or ex-situ bioremediation.

Question #3: Will a treatability study be required ?
Response: A treatability study is not mandatory. However, the contractor shall demonstrate the effectiveness of the proposed remedy to meet or exceed the bioremediation system objectives.

Question #4: Is lead stabilization by lime induction the only acceptable technology ?
Response: Contractor may propose other technically sound alternatives for lead stabilization.

Question #5: Are clean-up objectives negotiable with the Michigan Department of Natural Resources (MDNR) for total petroleum hydrocarbons (TPH) and lead (Pb)?
Response: The contractor shall remediate contamination at Sites #2 and #4 to below Michigan Public Act 307 Type B clean-up criteria as outlined in the MERA Operational Memorandums.

Question #6: How will clean up be verified ?
Response:: As outlined on pages 6 and 7 of the Request for Technical Proposal the contractor shall provide with his/her proposal a site monitoring plan. The monitoring plan shall be used to determine the progress and completion of the remediation. The plan shall include proposed sampling point identification, sampling methods and protocols, the frequency of interim sampling actions, project schedule and report outline in accordance with MDNR regulations. Please note, the MDNR does not recognize TPH concentrations as verification of remediation.

Question #7: Please clarify that the sinkhole near Site #4 is not part of the scope of work for this contract. Are we correct in saying that the sinkhole is not part of the scope of work, but the gully from Site 4 to the sinkhole is part of the scope of work ?

Response: The sinkhole is not part of the scope of work for this project. The gully from Site #4 to the sinkhole is part of the scope of work for this project. The gully must be remediated down to the surface water in the sinkhole. In addition, the construction debris which is currently stockpiled in and around the gully must be removed and properly disposed at an off-site facility.

Question #8: On page 2-19 of the SRAP under the section heading "Site 4 - Third Fire Training Area", the third bullet says "Soil borings along the pipeline...". Please clarify that the pipeline is not part of this contract scope of work.

Response: As outlined on page 6 of the Request for Technical Proposal under the heading "Work Under This Project", the contractor shall "remove and dispose of the concrete pad and piping at Site #4 in a proper manner". Therefore, the pipeline is part of the contract scope of work. The concrete and piping from Site 4 shall be properly disposed at an off-site facility.

Question #9: What is the volume of concrete to be removed at Site #4?

Response: The concrete pad in the fire training area is approximately 50 ft in diameter and 8 inches thick.

Question #10: Can the concrete be disposed of on-site ?

Response: The concrete must be properly disposed at an off-site facility.

Question #11: If contaminated groundwater is detected during groundwater depression with pumping will a change order be issued to dispose contaminated groundwater?

Response: The contractor shall remediate the soil at Site #4 to 20 ft below ground surface. According to page 2-11 of the SRAP, groundwater in the vicinity of Site #4 is approximately 25 ft to 30 ft below ground surface. Consequently, groundwater pumping will not be required.

Question #12: Have monitoring wells near Site #4 been sampled ?

Response: As outlined on page 2-19 of the SRAP under the heading of "Site 4 - Third Fire Training Area" no contaminants were detected in the shallow groundwater.

Question #13: Can we be provided with copies of the soil borings or drilling logs ?

Response: As outlined on page 2-4 of the SRAP, Site #2 hydrogeology is characterized by 55 feet of lacustrine deposits consisting of fine-to-coarse-grained quartz sand with occasional clay lenses. A shallow aquifer is located within 10 feet of the surface. As outlined on page 2-11 of the SRAP, Site #4 hydrogeology is characterized by 35 feet of lacustrine deposits consisting of fine-to-medium grained quartz sand. The limestone aquifer exists at 40 feet to 53 feet below

the land surface. Groundwater flow in the shallow aquifer (25 feet to 30 feet below land surface) is south-southwest toward the sinkhole.

Question #14: Is a Michigan Professional Engineer required to sign and stamp the proposal or just the design report and drawings ?

Response: The requirement for a Michigan Professional Engineer's stamp applies only to the design report and drawings.

Question #15: Do the analytical values reported in tables Table 2-1 and Table 2-2a for metals Be, Cd, Cr, Pb, etc. represent total metal concentrations (mg/kg) or TCLP metal concentrations (mg/l) ?

Response: The units shown for metals Be, Cd, Cr, Pb, etc... on Tables 2-1 and 2-2a of the SRAP indicate total metal concentrations expressed in mg/kg.

Question #16: Please explain the units in Table 2-2b including any method detection limits for data in Table 3-1 ?

Response: Table 2-2b of the SRAP lists semi-volatile organic compounds (SVOCs) in ug/kg (parts per billion) and TPH in mg/kg (parts per million). Table 3-1 of the SRAP is not intended to show analytical results from the site. Table 3-1 is a listing of Applicable or Relevant and Appropriate Requirements (ARARs).

Question #17: Do you recommend a laboratory for testing of parameters of concern ? Do you have an approved laboratory for analysis of samples to verify the clean-up objective achievement?

Response: The contractor's proposed laboratory must operate under the United States Environmental Protection Agency's (U.S. EPA's) Contract Laboratory Program (CLP).
However, analytical sampling for this project does not need to follow CLP sampling protocols.

Question #18: Can contaminated material from site 2 be brought to or near site 4 for biotreatment while site 4 is undergoing in-situ bioremediation?

Response: Yes, if it can be demonstrated that it is technically and economically feasible.

Question #19: Since the combined cost of remedial actions at site 2 and 4 using LTTT is less than bioremediation, and its considered to be acceptable technology, why do the bid documents appear to imply a request for in-situ or ex-situ bio?

Response: LTTT was considered and rejected in favor of bioremediation.

Question #20: There is no indication that the point source of contamination was identified nor is there an indication that the drainage system from the motor pool building to a point north of 1st Avenue (which represents the outfall into the drainage ditch) was decontaminated. Has the possibility of post-remediation recontamination been addressed?

Response: The possibility of recontamination has been addressed.

the land surface. Groundwater flow in the shallow aquifer (25 feet to 30 feet below land surface) is south-southwest toward the sinkhole.

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Response: The possibility of recontamination has been addressed.

Question #21: My RFTP did not include mapping that would indicate the sample locations for soil samples obtained in October 1991 or January 1993. Is this information available?

Response: This information can be found in the Draft Final Remedial Investigation Report.

CLARIFICATION: DEMOLITION OF THE EXISTING CONCRETE-BLOCK PIT AT SITE #4 SHALL BE CONSIDERED PART OF THE CONTRACT SCOPE OF WORK. THE PIT IS APPROXIMATELY 10 FT x 10 FT x 6 FT DEEP. THE STEEL RAILING SURROUNDING THE PIT SHALL BE REMOVED AND PROPERLY DISPOSED AT AN OFF-SITE FACILITY. THE CONCRETE-BLOCK WALLS AND BOTTOM OF THE PIT SHALL ALSO BE REMOVED AND PROPERLY DISPOSED OF AT AN OFF-SITE FACILITY. THE PIT SHALL THEN BE FILLED WITH CLEAN SAND BACKFILL TO MAKE THE PIT LEVEL WITH THE SURROUNDING LAND SURFACE. TOPSOIL AND GRASS SEED SHALL BE APPLIED TO THE AREA OVER THEPIT. THE AREA SHALL BE RESTORED TO ANNA CONDITION.

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B2

PRE-CONSTRUCTION MEETING

Pre-Construction Meeting Minutes
April 11, 1995
Alpena Combat Readiness
Training Center
Alpena, Michigan

Meeting Attendees:

Fred Kimble	Air National Guard (Alpena CRTC)
Rick Hayward	Air National Guard (Alpena CRTC)
William Delorme	Air National Guard (Alpena CRTC)
Jeanie Kampschroeder	National Guard Bureau
Karen Greenlee	USPFO for Michigan
Abe Juarez	Unico Construction
David Cooper	Unico Construction
Dave Newman	CCC Group, Inc.
Buzz Hafer	CCC Group, Inc.
Kevin Kelly	Montgomery Watson
Ben McGeachy	Montgomery Watson

Meeting Minutes:

These minutes document technical items discussed during the pre-construction meeting for the design and construction of a bioremediation system at the Alpena Combat Readiness Training Center (Alpena CRTC) in Alpena, Michigan. The meeting was held on April 11, 1995 and was attended by representatives of the Michigan Air National Guard (Alpena CRTC), National Guard Bureau, United States Purchasing and Fiscal Office (USPFO) for Michigan, Unico Construction (the selected contractor), CCC Group, Inc. (a subcontractor), and Montgomery Watson (the A&E oversight company). Technical discussion focused on Montgomery Watson's role during construction as well as items of Unico's Technical Proposal (dated February 22, 1995) which required clarification.

Jeanie Kampschroeder with the National Guard Bureau, outlined Montgomery Watson's role during construction. Montgomery Watson's duties include (but are not limited to):

- Providing technical support to Air National Guard personnel.
- Providing technical minutes from the pre-construction meeting.
- Providing review of contractor submittals. Montgomery Watson's review shall be completed within 5 working days of the receipt of the submittal.

- Providing on-site oversight for 15 days during pilot study testing. It was noted that Unico will not be conducting an on-site pilot study and that this portion of Montgomery Watson's time may be redirected to oversight of construction.

- Providing on-site oversight for the first 15 days of construction. During this period, Montgomery Watson personnel will be available on the base for 8 hours per day but will not exceed a maximum of 4 hours per day overseeing the contractor.

- Providing oversight one day per week for the 64 week period following the 15 day construction oversight.

- Providing oversight for six 2-day sampling events to be coordinated with contractor's schedule.

- Providing As-Built drawings.

It was stressed by Ms. Kampschroeder that Montgomery Watson personnel are not to discuss the project with the contractor or any subcontractors without Air National Guard personnel present.

A discussion was held concerning items of Unico's Technical Proposal which required clarification. Items raised for discussion and Unico's responses (as paraphrased) are as follows:

Item #1: Does Unico intend to submit a revised Technical Proposal ?

Response: If there are items of the Technical Proposal which need to be revised, a revised proposal will be submitted.

Item #2: The Technical Proposal shows construction of a treatment cell at Site #2. This area is heavily wooded. The Air National Guard would prefer that this treatment cell be constructed near Site #4.

Response: If a treatment cell is necessary for Site #2, the cell could be constructed near Site #4.

Item #3: Does Unico anticipate bringing in a site trailer ? If so, will utilities be required?

Response: Unico anticipates bringing a site trailer. Electricity, phone service, and water service will be needed.

Item #4: Please be advised that other contractors may be working near Unico work areas especially near Site #2 where a new water line is being installed.

Response: No response required.

Item #5: Is an air permit from the Michigan Department of Natural Resources (MDNR) needed?

Response: Discussions with MDNR have revealed that an air permit will not be required for this work.

Item #6: Please be advised that Unico is required to secure an excavation permit from the Air National Guard. Unico is required to contact Miss Dig (utility locating company). Unico may also be required to secure a soil erosion permit from the Alpena County Road Commission.

Response: No response required.

Item #7: Unico's Technical Proposal does not detail disposal of concrete at Site #4 (either in the gully near the sinkhole or the concrete block pit). The Air National Guard would like the concrete sampled, characterized, and properly disposed at an off site facility.

Response: Unico will comply with the requirements of the contract.

Item #8: Please be advised that the use of total petroleum hydrocarbons (TPH) as a sampling parameter for confirmatory samples may not be acceptable to the MDNR. All confirmatory sampling must be in accordance with MDNR procedures.

Response: Unico will review MDNR procedures and incorporate into a revised sampling plan.

Item #9: Unico's Technical Proposal must be stamped by a Professional Engineer certified by the State of Michigan.

Response: Unico will comply with the requirements of the contract.

Item #10: When does Unico anticipate beginning construction? When does Unico anticipate remediation to be completed?

Response: Unico would like to begin construction on May 1, 1995. Unico anticipates remediation to be completed within 90 days of the beginning of construction but will allow up to 150 days to complete remediation.

Item #11: Unico stated that they are considering changing the remediation approach at Site #2 from ex-situ bioremediation to in-situ bioremediation.

Response: Unico's proposed remediation approach at Site #2 should be documented in their revised Technical Proposal.

The meeting concluded with representatives of the Air National Guard, Unico, CCC Group, and Montgomery Watson touring the areas to be remediated (i.e. Site #2 and Site #4). A preliminary schedule of Montgomery Watson's deliverables has been attached to these technical minutes. This schedule has been developed based on contractor's anticipated start and finish dates. This schedule is subject to change based on changes to the contractor's schedule.

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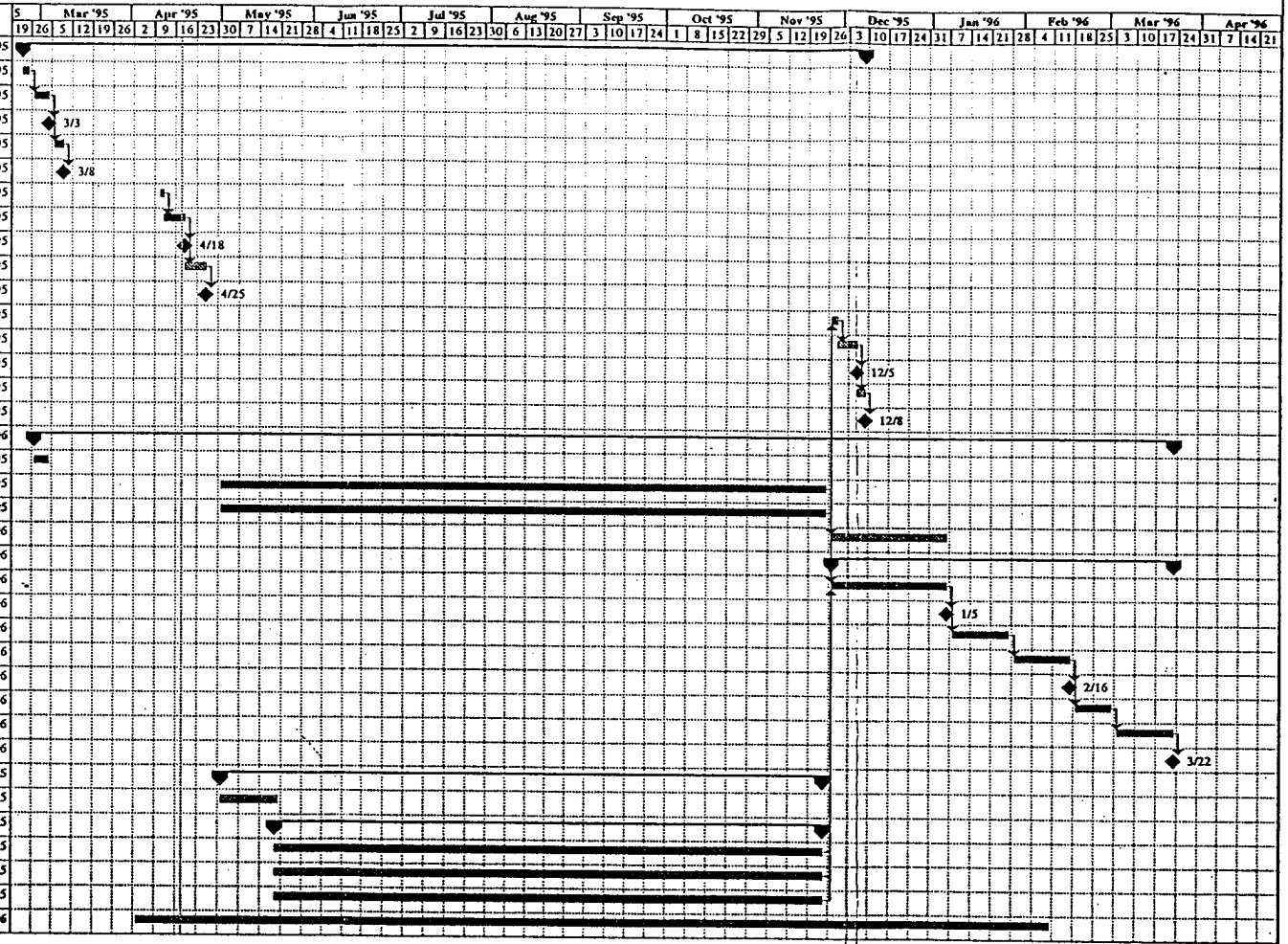
SURVEILLANCE AND OVERSIGHT OF REMEDIAL ACTIONS
ALPENA, MICHIGAN
Montgomery Watson

ID	Activity	Dur.	% Comp	Start	Finish
1	**Task 1 - Meetings**	207d	52%	2/23/95	12/8/95
2	Task 1A - Attend Pre-Bid Meeting	2d	100%	2/23/95	2/24/95
3	Preparation of Draft Meeting Minutes	5d	100%	2/27/95	3/3/95
4	Milestone: Submit Draft Meeting Minutes	0d	100%	3/3/95	3/3/95
5	Preparation of Final Meeting Minutes	3d	100%	3/6/95	3/8/95
6	Milestone: Submit Final Meeting Minutes	0d	100%	3/8/95	3/8/95
7	Task 1B - Attend Pre-Construction Meeting	1d	100%	4/11/95	4/11/95
8	Preparation of Draft Meeting Minutes	5d	100%	4/12/95	4/18/95
9	Milestone: Submit Draft Meeting Minutes	0d	0%	4/18/95	4/18/95
10	Preparation of Final Meeting Minutes	5d	0%	4/19/95	4/25/95
11	Milestone: Submit Final Meeting Minutes	0d	0%	4/25/95	4/25/95
12	Task 1C - Attend the Final Inspection	2d	0%	11/27/95	11/28/95
13	Preparation of Draft Meeting Minutes	5d	0%	11/29/95	12/5/95
14	Milestone: Submit Draft Meeting Minutes	0d	0%	12/5/95	12/5/95
15	Preparation of Final Meeting Minutes	3d	0%	12/6/95	12/8/95
16	Milestone: Submit Final Meeting Minutes	0d	0%	12/8/95	12/8/95
17	**Task 2 - Technical Assistance**	280d	1%	2/27/95	3/22/96
18	Task 2A - Assist Govt. in Review & Eval. of Technical Proposals	5d	100%	2/27/95	3/3/95
19	Task 2B - Review Submittals	150d	0%	5/1/95	11/24/95
20	Task 2C - Provide On-going Routine Technical Assistance	150d	0%	5/1/95	11/24/95
21	Task 2D - Provide As-built Drawings	30d	0%	11/27/95	1/5/96
22	Task 2E - Provide Completion Report	85d	0%	11/27/95	3/22/96
23	Complete Draft Completion Report	30d	0%	11/27/95	1/5/96
24	Milestone: Submit Draft Completion Report	0d	0%	1/5/96	1/5/96
25	NGB Review of Draft Completion Report	15d	0%	1/8/96	1/26/96
26	Complete Draft Final Completion Report	15d	0%	1/29/96	2/16/96
27	Milestone: Submit Draft Final Completion Report	0d	0%	2/16/96	2/16/96
28	NGB Review of Draft Final Completion Report	10d	0%	2/19/96	3/1/96
29	Complete Final Completion Report	15d	0%	3/4/96	3/22/96
30	Milestone: Submit Final Completion Report	0d	0%	3/22/96	3/22/96
31	**Task 3 - Field Work**	149d	0%	5/1/95	11/23/95
32	Task 3A - Field Inspection/Oversight Full Scale Operation	15d	0%	5/1/95	5/19/95
33	Task 3B - Field Monitoring, Inspection, & Oversight	135d	0%	5/19/95	11/23/95
34	Weekly 1 Day Visits	135d	0%	5/19/95	11/23/95
35	Quarterly 2 Day Visits	135d	0%	5/19/95	11/23/95
36	Task 3C - Optional Inspection/Oversight	135d	0%	5/19/95	11/23/95
37	**Task 4 - Preparation of Monthly Progress Reports**	225d	4%	4/3/95	2/9/96



Non-Critical Task | Critical Task | Milestone | Baseline Task
N/Critical Task Progress | Critical Task Progress | Summary | Baseline Milestone

B3

FINAL INSPECTION MEETING

Final Inspection Minutes
September 1, 1995
Alpena Combat Readiness
Training Center
Alpena, Michigan

Meeting Attendees:

Captain Fred Kimble	Air National Guard (Alpena CRTC)
Dave Newman	CCC Group, Inc.
Rene Garcia	CCC Group, Inc.
Doug Barber	Montgomery Watson

Meeting Minutes:

These minutes document technical items discussed during the final inspection for the design and construction of a bioremediation system at the Alpena Combat Readiness Training Center (Alpena CRTC) in Alpena, Michigan. The meeting was held on 14 August 1995 and was attended by representatives of the Michigan Air National Guard (Alpena CRTC), CCC Group, Inc. (a subcontractor), and Montgomery Watson (the A&E oversight company). A punch list of items was developed (attached) as well as discussion of the following:

Unico should have a rough draft of a construction report to Captain Fred Kimble within three weeks from today (4 September 1995). Fred Kimble will send a copy of the draft to Montgomery Watson for review.

Dave Newman will develop seven or eight rolls of project film, but only select photos will be included in the report. Original photos will go to Captain Kimble.

Mr. Newman will send Montgomery Watson copies of the analytical results with his report.

Captain Kimble is concerned about grass seeding. Details of the seeding (including grass mixture) will be discussed in Unico's report presented by Mr. Newman.

Unico did not remove existing top soil beneath the biopiles.

The telephone line was cut. No party has received a bill yet; costs will be assigned later. Captain Kimble proposes to split costs, and Mr. Newman agrees.

There is a question concerning the elevation of the PVC pipe at Site 2. Captain Kimble and Doug Barber will check with the base and Pleasant View Ranch for information. (Later work on this subject reveals no information; therefore, the elevation of the reinforced concrete pipe (RCP) will be based on an arbitrary datum.)

Mr. Newman estimates that greater than 2 ft of soil is placed over the RCP, but will check his notes.

Sampling locations will be detailed in Mr. Newman's final report. Montgomery Watson will include Mr. Newman's sampling locations in their report by reference or addendum.

Punch List:

Site 2

- Level pile of sand at terminus of RCP.
- Place bales of straw along south bank of terminus of RCP.

Site 4

- Remove bales of hay by TF4-MW3
- Level small pile by TF4-MW3
- Tie in silt fence by sinkhole.

The meeting concluded with representatives of the Air National Guard, CCC Group, and Montgomery Watson touring the remediated areas (i.e. Site #2 and Site #4), see attached photographs.

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C

UNICO'S BIOREMEDIATION SYSTEM DESIGN

BIOREMEDIATION SYSTEM DESIGN

Bioremediation System
Michigan Air National Guard CRTC

* * *

Prepared for:

Michigan Air National Guard CRTC

* * *

Prepared by

Unico Construction Company
San Antonio, Texas
May 1995

27 April 1995

Environmental Consultants & Services, Inc.

Mr. David Newman
CCC Group
PO Box 200350
5797 Dietrich Rd.
San Antonio, Texas 78220-0350

RE: Review of Excavation Plan
Bioremediation Project
Michigan Air National Guard
Alpena, Michigan

Dear Mr. Newman:

I have reviewed the Bioremediation System Design and Work Plan dated April 1995 for the Michigan Air National Guard project in Alpena, Michigan.

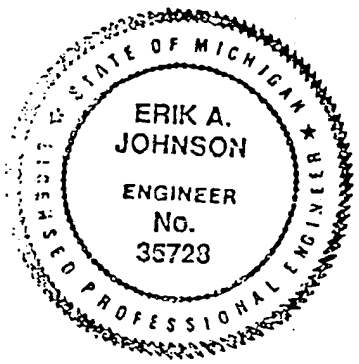
The plan specifies that soil excavated at Site 4 will be classified as Type C soil, defined under 29 CFR Part 1926 OSHA Subpart P Excavations and Trenches as "granular soils including gravel, sand, and loamy sand." In addition, the plan specifies that excavation of soil in this area during the project will be conducted such that excavation sidewalls will not exceed a slope steeper than one and one-half horizontal to one vertical (34 degrees from horizontal) and in a manner such that no person will ever enter the excavation.

Subsequent amendments to the work plan which I reviewed have included provisions for prohibiting access to the excavation area for the duration of the project using orange barricade fencing and caution tape. In addition, it is my understanding that stormwater diversion berms will be positioned to preclude stormwater run-on from entering the excavation and stockpile areas.

Based on my review of the excavation plan, with the amendments and assumptions provided for review, the excavation plan presented by CCC Group, Inc. provides for side slope stability and adequate safety considerations in accordance with industry standards.

Sincerely,

Environmental Consultants & Services, Inc.



Erik A. Johnson, PE, CPG
Sr. Project Manager

EAJ/mem
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BIOREMEDIATION SYSTEM DESIGN

Preliminary investigations included in the bid package indicate that bioremediation would be an effective treatment technology for the Michigan Air National Guard Combat Readiness Training Center (CRTC) in Alpena, Michigan. Unico Construction Company's (Unico's) proposed bioremediation system design for this site is an ex-situ bioremediation system designed specifically for the field conditions at Alpena, Michigan. This system includes the use of a Royer shredder/mixer with a Cooper spray system.

The Royer shredder/mixer mechanically particlizes, homogenizes, and oxygenates the contaminated soils and directly inoculates the soil with the proper proportions of microorganisms, nutrients, and water. Once the contaminated soil is excavated, it is loaded into a feed hopper and conveyed into an enclosed chamber where the soil is broken into very small particles not to exceed 1/2 inch in diameter. These particles are then discharged in the shape of a thin horizontal rectangular stream from the particlizing chamber where the inoculator subsequently sprays the controlled amount of nutrient/microbe/water solution onto the particles immediately at the point of discharge. Items such as rocks, bricks, steel, etc. which can not be particlized are ejected to the side via a trash-a-way conveyor.

The work to be performed under this project will include the following:

- Bioremediation of Site 2
- Lead Stabilization of Site 2
- Bioremediation of Site 4
- Solid waste disposal at Site 4
- Installation of drainage culvert and gate valve
- Restoration of Site 2 and Site 4

This work will be performed in accordance with the approved work plan and schedule. A copy of the work schedule will be provided under a separate transmittal.

We will begin mobilizing equipment and personnel to the jobsite after the submittals have been approved. Proposed equipment used at the jobsite include a Royer model 401, a large track excavator, two rubber-tire front end loaders, a backhoe, and compactor. We will use a storage van for storage of small tools, as well as office space. The work crew will consist of one Superintendent, two operators, and one laborer. The Superintendent for this project will be Mr. David Newman. Technical and administrative support will assist the field crew.

Unico will delineate the work site into three work zones: the Exclusion Zone (EZ), Contamination Reduction Zone (CRZ), and Support Zone (SZ). Caution tape and orange barricade fencing will be used to delineate these zones. These zones are described in detail in the Site Health and Safety Plan. Inside the EZ, we will delineate the actual work area as interpreted from Figures 2-3 and 2-4 from the Request for Proposal. The bioremediation area will be located north of Site 4. These locations are shown on the site layout included as Appendix A. Assistance from the Site Representative may be necessary during the site layout. **A composite soil sample from Site 4 and Site 2 will be collected at this time and submitted to Micro-TES for a treatability**

analyses. This day is tentatively scheduled for Monday 22 May 1995.

The site visit and discussions with the Air National Guard (ANG) concluded that the bioremediation of Site 2 could be accomplished in situ. Biologists from CCC Group, Inc. and Micro-TES, Inc. have reviewed the information contained in the RFP for this project concerning the type of contamination and the extent of contamination. According to this information, the vertical extent of the contamination is 1-ft. Thorough mixing of microbes, nutrients, water, and oxygen in sandy soils to 1-ft is easily accomplished by standard gardening techniques. Assuming that this mixing can be accomplished in-place and the hydrocarbon degrading bacteria are effective (Previous experience with LFS-1™ indicates this blend of microbes will degrade this type of hydrocarbon contamination. Testimonials, bench-scale tests, and full-scale test data is included as Appendix B.), bioremediation of Site 2 to 100 parts per million (ppm) TPH by EPA method 418.1 will be accomplished. Therefore, as opposed to our initial proposal, Unico will bioremediate Site 2 in place using the same mixture of microbes and nutrients as Site 4 spray-applied with a hand held sprayer. This mixture will be worked into the soil to a depth of one foot using a tiller or other mechanical means. The soil will be tilled two to three times, as necessary according to field screening methods.

According to paragraph 2.4.1 of the specifications, the in-place soil volume requiring metals removal is estimated to be 8600 ft^3 or 319 yd^3. Previous metals stabilization projects by CCC Group and WPI, Inc. using a 2% addition of cement kiln dust have produced leachable metal levels below TCLP levels established by the federal government. Although the pH may be raised slightly, the primary method of stabilization is through fixation. Stabilization of lead will be confirmed through sampling and analysis as indicated in our monitoring plan.

The area of Site 2 to be treated for lead is 430 ft long. This includes 150 ft that is to be bioremediated prior to lead stabilization. Unico will use Portland cement to stabilize the lead. Portland cement is a Michigan Department of Environmental Resources (MDNR) approved product for lead stabilization. As long as an approved product is used to stabilize the lead and the stabilization is performed at the zone of contamination, no MDNR permit is necessary.

The estimated cubic yards of soil to be stabilized is 319 cy. Unico estimates that it will require 2% Portland cement to stabilize the soil. Therefore, 6.4 cy of Portland cement will be used to stabilize the soil. The Portland cement will be mixed into the soil using the tiller, similar to the bioremediation of Site 2 process. After thorough mixing of the Portland cement and the contaminated soil, the lead should be stabilized to below the state requirements.

Pending the notice to proceed with the installation of the Concrete Reinforced Pipe (CRP) culvert. Unico will install a 12-in diameter CRP drainage culvert with sufficient drop to allow adequate flow. The existing pipe appears to be 12-in diameter. A gate valve will be installed at the head of the culvert to shut off flow in the event of an emergency. This work will be performed after the soil has been remediated and stabilized.

Upon completion of the drainage culvert installation, Site 2 will be backfilled with approximately 270 cy of select fill material. Site 2 will be backfilled and shaped to existing grade. The site will then be seeded with appropriate grasses.

Approximately 70 cy of concrete and brick debris is located south of Site 4. This debris includes a masonry 10' x 10' x 6' block with steel rails. This debris is non-contaminated and will be disposed of at the BFI landfill in Alpena, Michigan as construction debris. Large blocks of concrete will be broken with a hydraulic breaker attached to a backhoe. The debris will be loaded into BFI trucks with a large track excavator and front end loader. The debris will be hauled directly to BFI for landfilling. The 8 in concrete pad located in the center of Site 4 will be sampled and tested per BFI requirements. This concrete will be transported and disposed of at the BFI landfill as special waste or construction debris based on the sample results.

A Bioremediation cell will be constructed north of Site 4 as indicated on the Site Layout. This cell will be constructed of heavy plastic at least 30-mil thick. It will be bermed with either hay bales or soil. A layer of clean sand approximately 6-in thick will be placed on the plastic to protect the integrity of the plastic. The contaminated soil will be placed into this cell while it is being bioremediated. Previous projects using this design have proved that our bioremediation cells can maintain their integrity and will not leak or tear. Observations of the liner will be made as it is put down. If any defects are identified, they will be repaired. Additionally, no heavy equipment will be required to enter these cells until the soil is remediated. A drawing of the bioremediation cell is attached as Appendix C.

The bioremediation area is located on a level grade. No structures will be constructed, therefore no geotechnical information is necessary. Visual observations were made and indicate the site will suffice for stockpiling soil. The soil is placed into the cells by the Royer from a drop of approximately 12-ft. The soil will be piled to a height of approximately 8-ft under its own angle of repose.

Oxygen and water are necessary components for the aerobic reactions desired for bioremediation. Therefore, we do not want to cover the stockpiles. However, if heavy precipitation is expected, we may cover the stockpiles with a light-weight plastic. Berms will be constructed around each cell to prevent run-on or run-off. **A sump will be excavated in the bioremediation cells to collect any excess water. It is anticipated that the sand fill layer below the contaminated soil will be sufficent to drain and hold most of the water that might collect in the bioremediation cells. However, in the unlikely event that it becomes necessary to remove excess water, the water will be pumped from the sump into a clean holding tank provided by the contractor. This water will be analyzed for the contaminates of concern. After the water has been characterized by laboratory analyses, the options for discharge will be analyzed. If necessary, this water will be re-applied to the bioremediation piles, discharged to the POTW, or discharged to the land. All discharges will comply with MDNR and local requirements.**

Three areas will need to be bioremediated at Site 4. Those areas include the Fire Training Area (FTA), Pipeline, and Gully. According to the project specifications, the outer edge of the concrete pad is assumed to be the extent of horizontal migration at the FTA. According to the specifications, the contamination is cylindrical to a depth of 20 ft below grade plus a cone to 26 ft deep. The pipeline runs from the FTA approximately 200 ft to the 10' x 10' x 6' masonry block. The zone of contamination is estimated to be 200 ft long by 5 ft wide by 20 ft deep. The gully to be excavated is 80 ft long by 20 ft wide by 1 ft deep.

The soil excavated from these sites will be conveyed with a large front end loader to the Bioremediation area. A second front end loader will be used to load the Royer located in the bioremediation area. The Royer with spray bar attachment will apply a 50:50 mixture of microbes and nutrients at a rate of 1 gallon per cubic yard of soil. The microbes chosen for this project are a custom blend of various species of bacteria chosen based on the type of contaminants present. The tradename for this particular blend is LFS-1™. Nutrients to be added include: monoammonium phosphate, potassium chloride, ammonium nitrate, and trace elements. The microbes will be mixed with water at the site and applied with the Royer. The treated soil will be ejected into the bioremediation cell to be remediated. Equipment specifications for the Royer are included as Appendix D.

The FTA will be excavated in two stages. First, the top 5 ft of soil will be removed with a track excavator or front end loader. Second, the track excavator will be used to dig to the bottom of the excavation per the attached drawing. A Komatsu PC300 track excavator or equivalent machine will be used to dig the deeper excavations. The specifications for this piece of equipment are included in Appendix D.

The excavator with the R3.9D stick can dig 8 ft at a maximum depth of 25 ft 5 in. After removing the top 5 ft, the total depth to excavate is only 21 ft. Therefore, this excavator should be able to dig the required depth of 26 ft and maintain a legal slope. According to the specifications, the soils at Site 4 appear to be an OSHA class C soils. These soils must be sloped back at least 1.5 H:1 V to maintain slope stability. Since the excavation depth is 26 ft deep, the limit of the excavation must slope back 39 ft past the zone of contamination. After the top 5 ft is excavated, the excavator should be able to dig the required depth and maintain distance of at least 14 ft from the actual excavation. The excavation will begin on one side and work backwards. The excavator will be positioned so it can rotate 90° and dump. If necessary, the excavator will construct a ramp to position itself while operating.

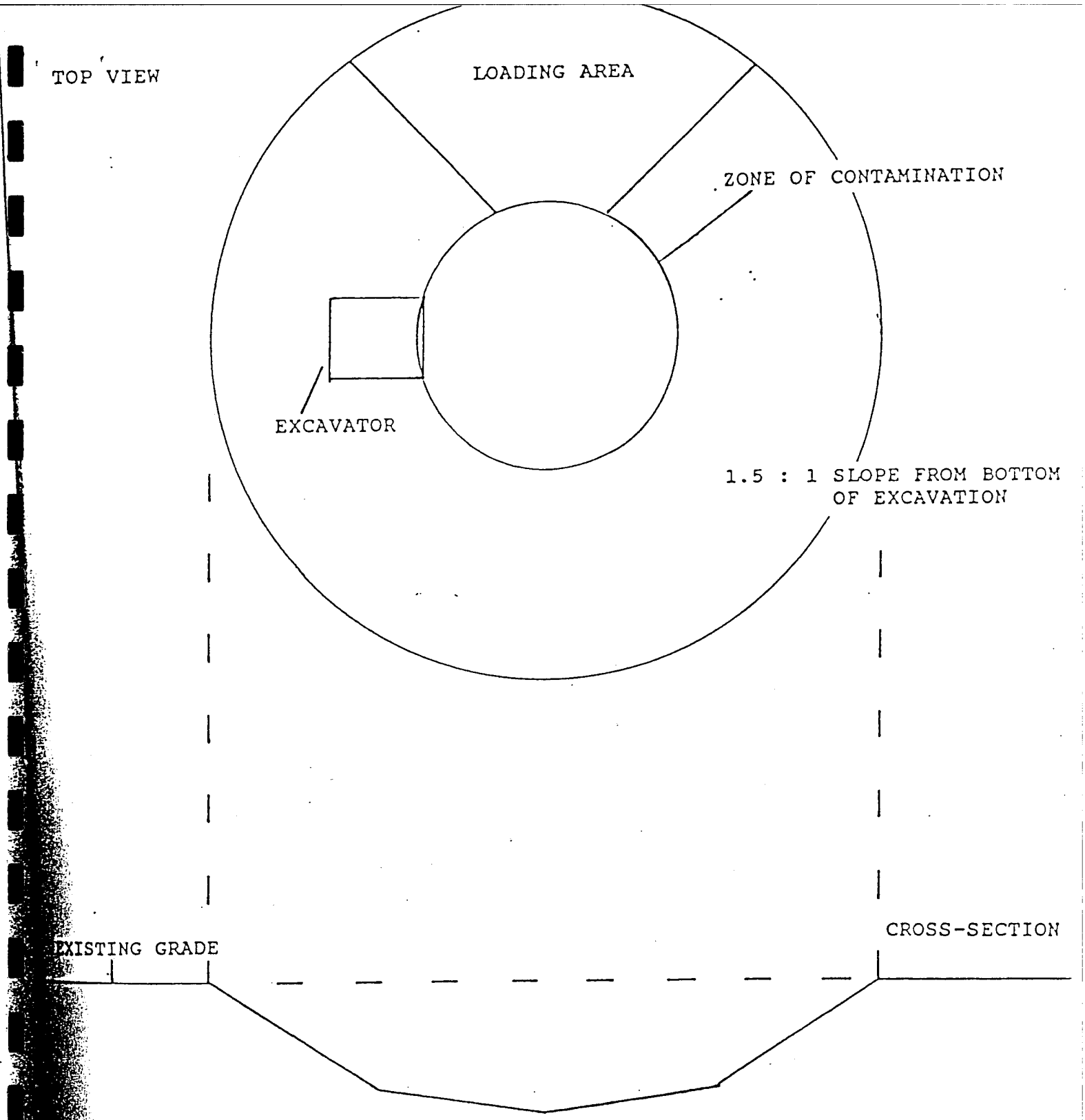
The pipeline will be excavated in a similar manner, with a slope of 1.5 H:1 V. The gully will be excavated to 1 ft with the excavator or front end loader.

Although the slope stability appears to be sufficient, personnel will not be permitted to enter the excavations. As indicated in our monitoring plan, we will obtain samples from the excavations using the trackhoe or backhoe bucket. We expect that no one will ever have to enter any of the excavations. The monitoring plan also indicates that sidewall and bottom samples will be collected and analyzed to verify the clean up according to MDNR standards. All excavations will be barricaded with orange barricade fencing. Caution tape will be used around the bio cells. Also, the general public will not have access to the ANG. To prevent stormwater run-on, we will construct a berm to direct water away from the excavations.

Once the soils have been remediated based on the monitoring plan, these soils will be placed back into the original excavations. The front end loaders will be used to roll in the soil and compact the material. After the areas have been backfilled to grade and shaped, the affected areas will be seeded with appropriate seeds and restored to original condition or better.

A final report depicting the field activities, sample results, and other pertinent information will be prepared for the Air National Guard to be turned into the MDNR. This report will be submitted at the end of the project.

APPENDIX A



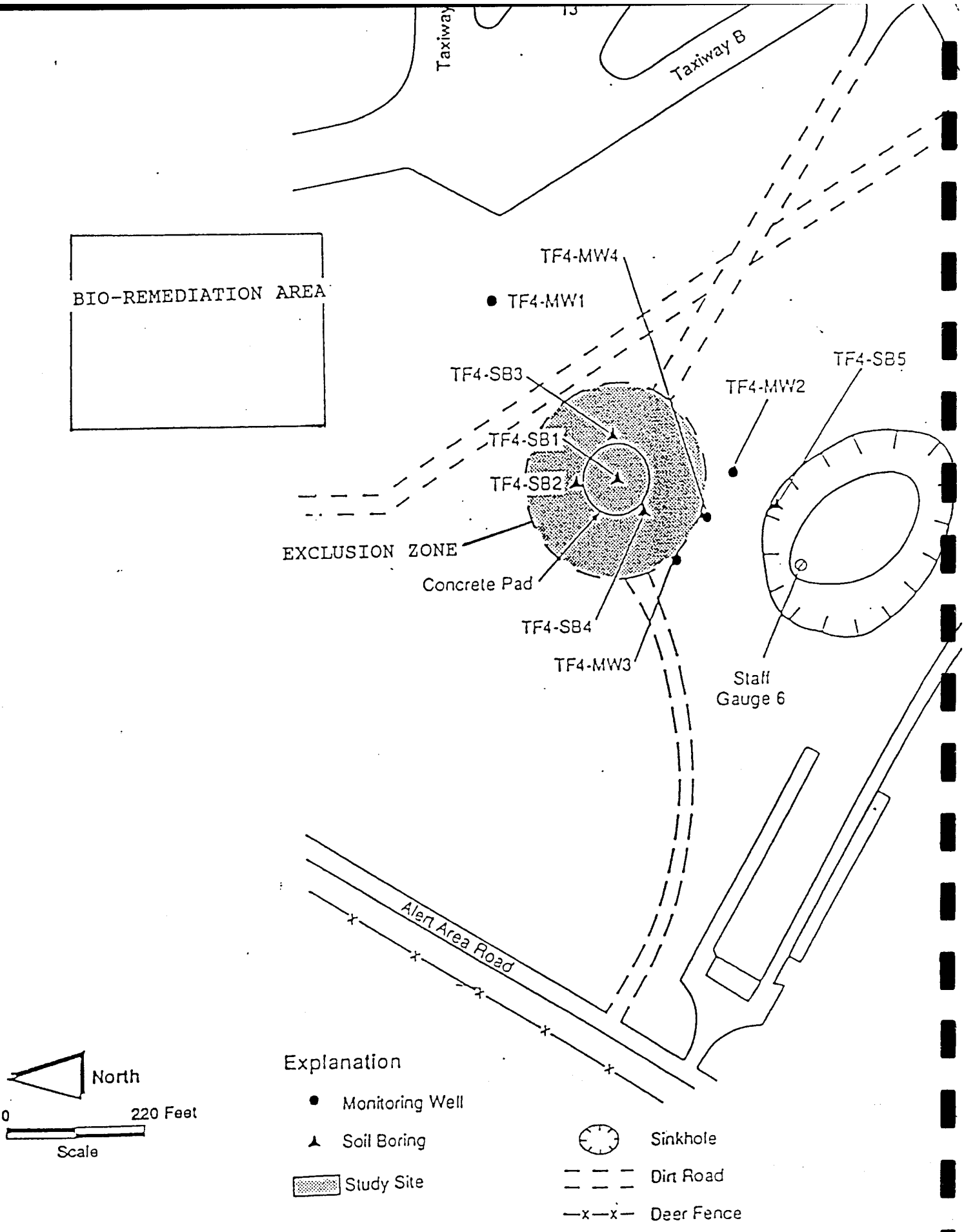
NOTE 1 : EXCAVATOR WILL MAINTAIN A DISTANCE OF 14' FROM EXCAVATION

NOTE 2 : TOP 5' OF SOIL WILL BE REMOVED DURING INITIAL EXCAVATION

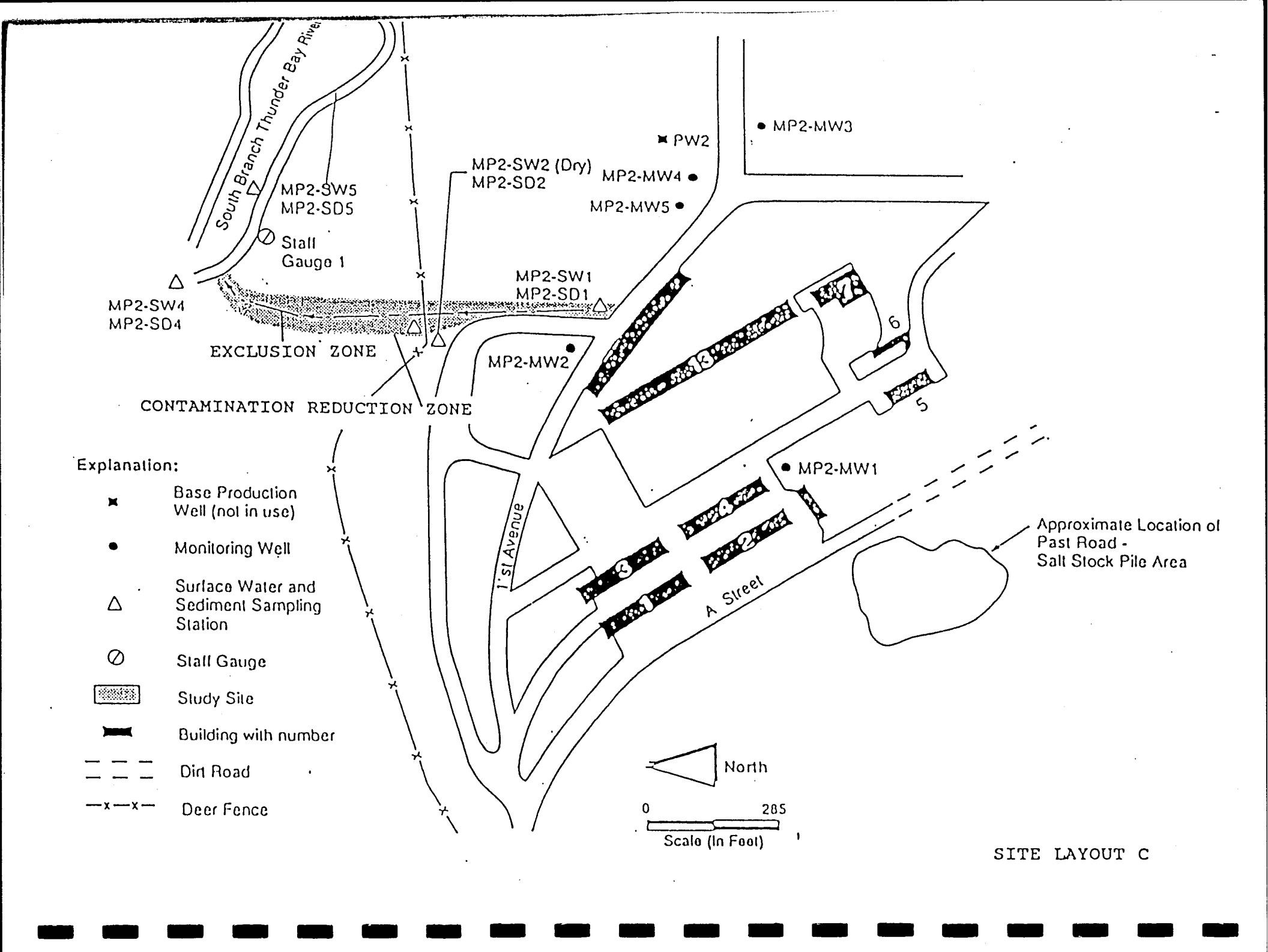
SCALE

0' 10' 20'

SITE LAYOUT A



SITE LAYOUT B



SITE LAYOUT C

APPENDIX B

BIOREMEDIATION MECHANISM

Petroleum hydrocarbons belong to a family of organic chemicals called Alkanes. The aerobic biological mechanism of alkane metabolism in both short and long chain hydrocarbons occurs monoterminally to the corresponding alcohol, aldehyde and monobasic fatty acid. The primary alcohol derived from alkane is oxidized to the corresponding aldehyde by alcohol dehydrogenase, and the aldehyde is oxidized to a fatty acid by aldehyde dehydrogenase. The end by-products of these reactions are fatty acids, carbon dioxide, and water.

PATHWAY OF ALKANE OXIDATION

$H_3C\text{-}(CH_2)_n\text{-}CH_3$

O_2

$H_3C\text{-}(CH_2)_n\text{-}CH_2OH$
(Primary Fatty Alcohol)
*Note: From this point the process can proceed anaerobically

$H_3C\text{-}(CH_2)_n\text{-}CHO$
(Fatty Aldehyde)

$H_3C\text{-}(CH_2)_n\text{-}COOH$
(Monocarboxylic Fatty Acid)

O_2

$HOH_2C\text{-}(CH_2)_n\text{-}COOH$
(Hydroxy Fatty Acid)

$HOOC\text{-}(CH_2)_n\text{-}COOH$
(Dicarboxylic Fatty Acid)

WHY BIOREMEDIATE?

Soils contaminated with hydrocarbons may be disposed of or treated in several ways: regulated permitted landfills, thermal incineration and bioremediation. The latter is a method that treats the soils and renders them non-hazardous, thus eliminating any future liability that may result from landfill problems or violations.

Landfill disposal costs range from $34 per yard to over $200 per yard depending on hydrocarbon concentration. Thermal incineration costs range from $60 to over $100 per yard. Bioremediation costs range from $20 to $40 per yard. Bioremediation can be done on site or at a bioremediation facility.

COMPARISON OF BIOREMEDIATION AND OTHER TECHNIQUES

In the past, clean-up approaches were limited to digging up contaminated soils and hauling them away, or leaving the contamination in place and covering it with a soil cap to prevent rainfall leaching. Today, excavation remains as a viable alternative to clean-up; however, new advanced technologies have evolved. These new technologies include the following:

Soil Gas Extraction: A process by which petroleum vapors are removed from the soil using wells and vacuum pumps. Volatile compounds are extracted from the area between soil particles by applying negative pressure to screened wells in the vadose zone.

Low Temperature Thermal Stripping: A process by which soil is excavated and fed into a mobil unit designed to heat the soil and drive off contaminates.

Excavation: A process which involves the digging up of contaminated soils and hauling them away.

Bioremediation: Is a process which uses naturally occurring microorganisms to enhance normal biological breakdown. It is an effective method for treating many hazardous materials.

Of all the different processes available for clean-up of sites, we feel that Bioremediation is the best and most cost effective method for remediation with respect to environmental liability. The nature and location of the contamination, the type of soils and geological conditions determine which method of remediation is best for each individual clean-up site.

CURRENT BIOREMEDIATION METHODS INCLUDE:

The use of liquid suspended live microbes, indigenous microbes and dehydrated microbes.

LIQUID SUSPENSION OF LIVE CULTURED MICROBES (LFS-I^{TM})

This method uses living cultures of known hydrocarbon digesting microbes and secondary microbes that are known to digest the waste products produced by the primary microbes. This method is superior to the dehydrated method because of the following:

1. The number of bacterial species can easily be preserved during this process, and the bacterial colony counts are greater than that of the dehydrated microbes method, thus it is a stronger and more effective method.
2. This method involves no dehydrating and rehydrating of bacteria that can rupture the cell walls, causing the colony counts to drop.
3. The microbes can immediately begin their digestive process as they are inoculated into the contaminated substance.
4. There is a significant amount of nutrients supplied in this mixture.
5. The liquid suspension live microbes mixture can be custom tailored for each site.
6. The liquid suspension live microbes method is less expensive and more effective than the dehydrated microbes method.
7. There is no residue to clog up screens in pumps or spraying equipment.

MATERIAL SAFETY DATA SHEET FOR LFS-1™

1.Product Identification

Product Name: LFS-1™
Chemical Name: Bacterial Additive
Chemical Family: Bacterial
Formula: Bacteria Blend
Manufacturer: Micro-TES, Inc.
12500 Network, Suite 201
San Antonio, Texas 78249
(210) 558-4757 or 558-4674

2. Hazardous Ingredients

Ingredient: None
TLV: None

3. Physical Properties

Tan/Off white liquid with slight odor.
Specific Gravity: One
Boiling Point: 212 degrees Fahrenheit
Evaporation Rate: Equal to Water
Melting Point: N/A
Vapor Pressure: N/A
Solubility in Water: N/A
Percent Volatile: N/A

4. First Aid Measures

Inhalation: Normal use should not cause irritation. If reaction occurs, remove to fresh air and consult your physician. Eyes: If product contacts eye area, flush with water. Skin: Normal use should not cause irritation. Wash skin with soap and water after contact with product. If irritation occurs, consult your physician. Internal: Product is not to be taken internally. If this occurs do not induce vomiting and seek medical attention.

5. Health Hazard Information

Threshold Limit Value: N/A
Effects of Overexposure: If taken internally will cause slight intestinal upset. Emergency and First Aid: Product is for external use only. If taken internally, call a physician.

6. Fire and Explosion Hazard Information

Flash Point: N/A
Flammable Limits: N/A
Extinguishing Media: N/A
Special Fire Provisions: None
Unusual Fire Hazard: None

7. Hazardous Reactivity

Stability: Stable
Conditions to Avoid: Extreme heat, strong acids and bases.
Incompatibility: Not compatible with strong acids.
Hazardous Decomposition Products: N/A
Hazardous Polymerization: N/A

8. Spill or Leak Procedure

In the event of a spill or leak, rinse thoroughly with soap and water, dispose of down drain.
Waste Disposal Method: Comply with all Local, State and Federal regulations.

9. Special Precautions

Handling and Storage Precautions: Avoid extreme heat, store in a cool dry place, do not freeze.
Other Precautions: Practice good housekeeping procedures.
Container Disposal: Do not reuse container. When empty, rinse before disposing. Dispose of in accordance with local laws and ordinance.

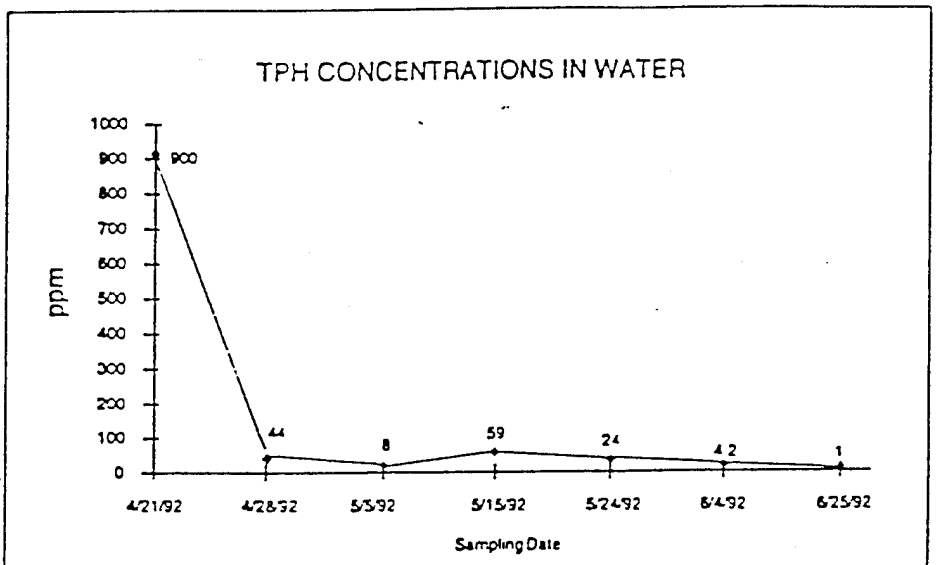
10. Notice

All statements, information and data provided in this MSDS are believed to be accurate and reliable, but are presented without guarantee, warranty, or responsibility of any kind, expressed or implied, on our part. Users should make their own investigations to determine the suitability of the information or products for their particular purpose. Nothing contained herein is intended as permission, inducement or recommendation to violate any laws or to practice any invention covered by existing patents.

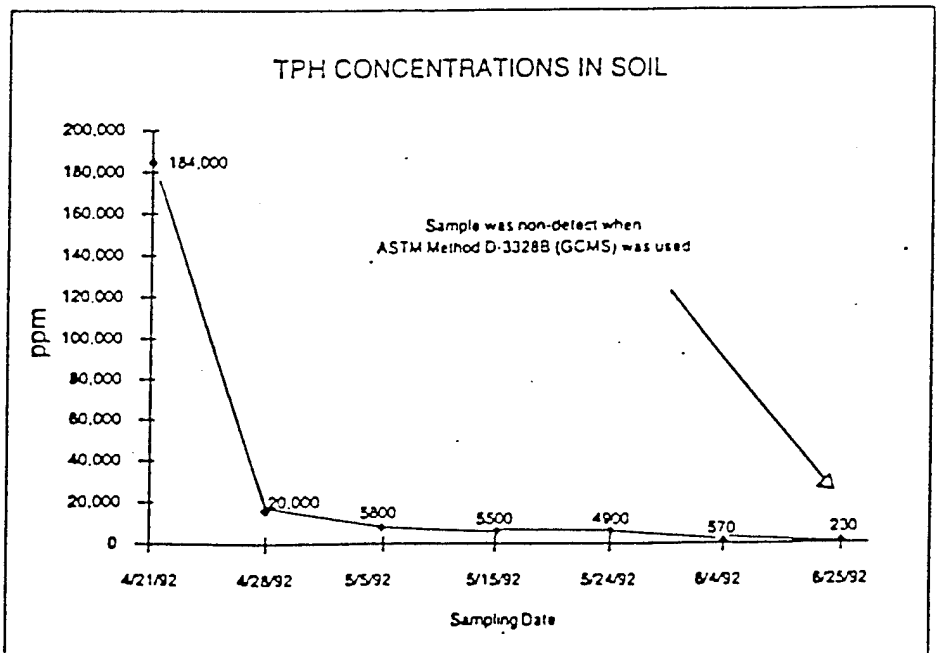
SAMPLE PILOT STUDY

The following is an example of a pilot study conducted for a major oil and gas service company. Bioremediation was done on wash rack waste consisting of soil, water, and hydrocarbons. The types of hydrocarbons present were gasoline, diesel, hydraulic fluid, oil base drilling mud, and gear grease. Initial TPH (Total Petroleum Hydrocarbons) reading on the soil was 184,000 ppm. The water has a TPH of 910 ppm. The analytical method used to test the water was 418.1. In approximately 60 days, the soil had been reduced to 230 ppm TPH and the water had decreased to 1 ppm. The soil sample was analyzed using ASTM Method D-3328B (GCMS) and was found to be non-detect. Note: This analytical method only detects hydrocarbons that boil at temperatures below 600° Fahrenheit. This test method is completely acceptable to the EPA and TNRCC.

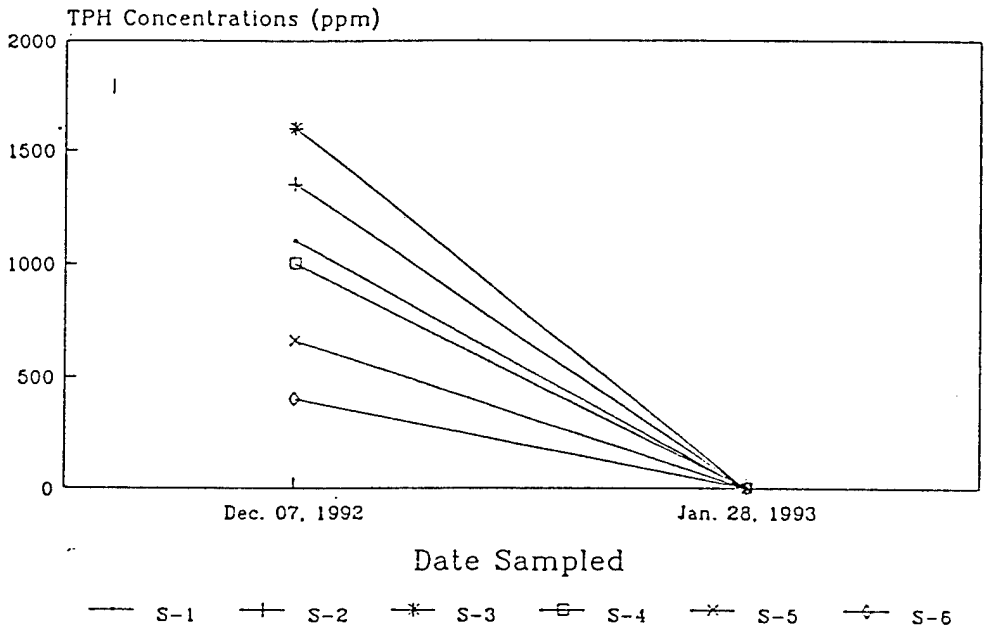
Remediation times would have probably been shorter if the air supply that was being used to sparge the soil and water mix had contained an oil trap. Compressor oil was being dumped into the system until May 16, 1992. The results are presented graphically below.



NOTE: Air compressor was unloading oil through the air supply line. Estimate five to ten oz per week until oil trap was installed on May 21.



BIOREMEDIATION (SOIL)
(TPH CONCENTRATIONS)

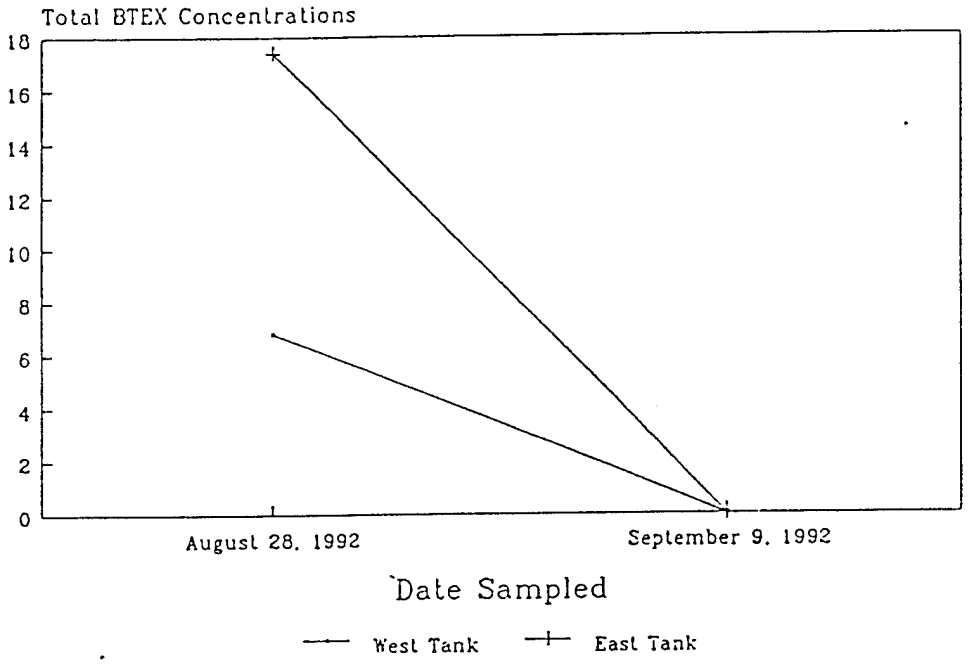


Six bio-cells sampled (S-1 through S-6)

Approximately 550 to 600 cubic yards of stained soil was removed from around leaking air compressors which aided in the operation of a refrigeration system. The contaminated soil was placed in a 12,000 square foot bioremediation cell. The cell was divided into six sections (S-1 through S-6). Composite soil samples were collected throughout the bio-cell and submitted to a laboratory. Laboratory analysis indicated TPH concentrations between non-detectable (ND) and 1,600 ppm. The soil with ND hydrocarbon concentrations was used as berm material around the bio-cell.

During the first week of December, 1992 the contaminated soil was pulverized into a fine powder using a rotor-tiller (Brodeson Model LSPPM8A) and was hand sprayed with **LFS-1™** and a nutrient mix. The treated soils were tilled three times during the following eight weeks in order to stimulate bacteria growth through aeration. Final composite soil samples were collected on January 28, 1993 and submitted to a laboratory for determination of TPH concentrations. Laboratory analysis indicated ND concentrations in all samples. Following review of the data and approval from the TNRCC, the bio-cell was dismantled and the treated soils were spread out on site.

BIOREMEDIATION (WATER)
(BTEX CONCENTRATIONS)

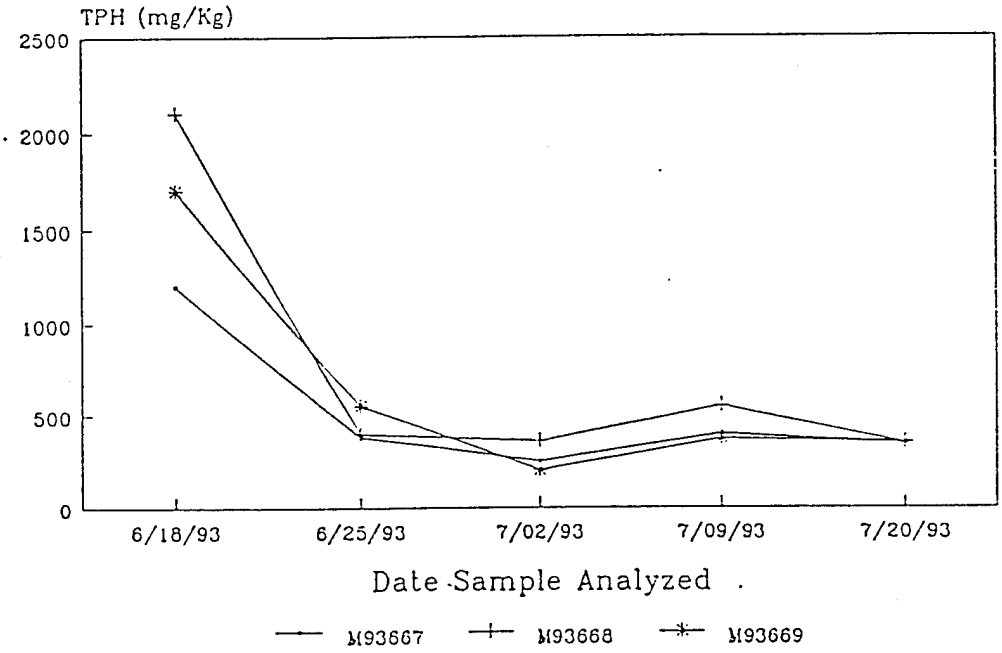


Prior to the removal from service of two 10,000 gallon Underground Storage Tanks (UST's) all fluids in those tanks must be removed and disposed of properly. The two tanks being removed were full of water with Total BTEX concentrations at 6.816 ppm in the West Tank and 17.480 ppm in the East Tank. In order to reduce the cost of disposal, the contaminated water in both UST's was treated with **LFS-1™** and an associated nutrient mix.

On August 28, 1992 approximately 25 gallons of **LFS-1™** (bacteria/nutrient mix) was introduced through a small electric pump into each UST. An electric air compressor and air hoses were installed and used to sparge the contaminated water in both tanks in order to stimulate bacteria growth through aeration. This process continued through September 9, 1992 at which time additional water samples were collected from each UST and submitted to a laboratory for determination of Total BTEX concentrations. Laboratory analysis indicated less than 0.004 ppm (non-detectable) Total BTEX concentrations in both samples.

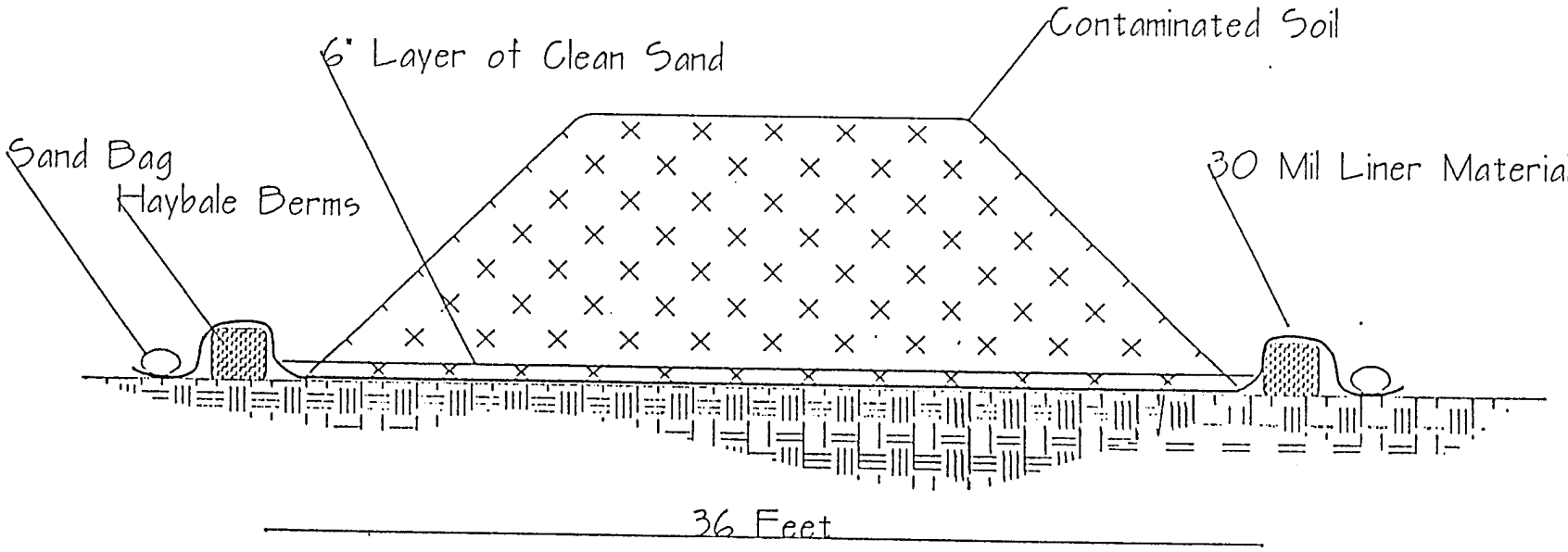
Soil Remediation: LFS-1

New Mexico Landfill



On June 18, 1993 approximately 1400 cubic yards of contaminated soil were ground down using a Royer Shredder. LFS-1™ and nutrient were applied using spray bars mounted on the shredder. Soil samples were collected weekly and analyzed for TPH using EPA Method 8015. The clean-up level of 600 ppm was achieved one week following treatment.

APPENDIX C

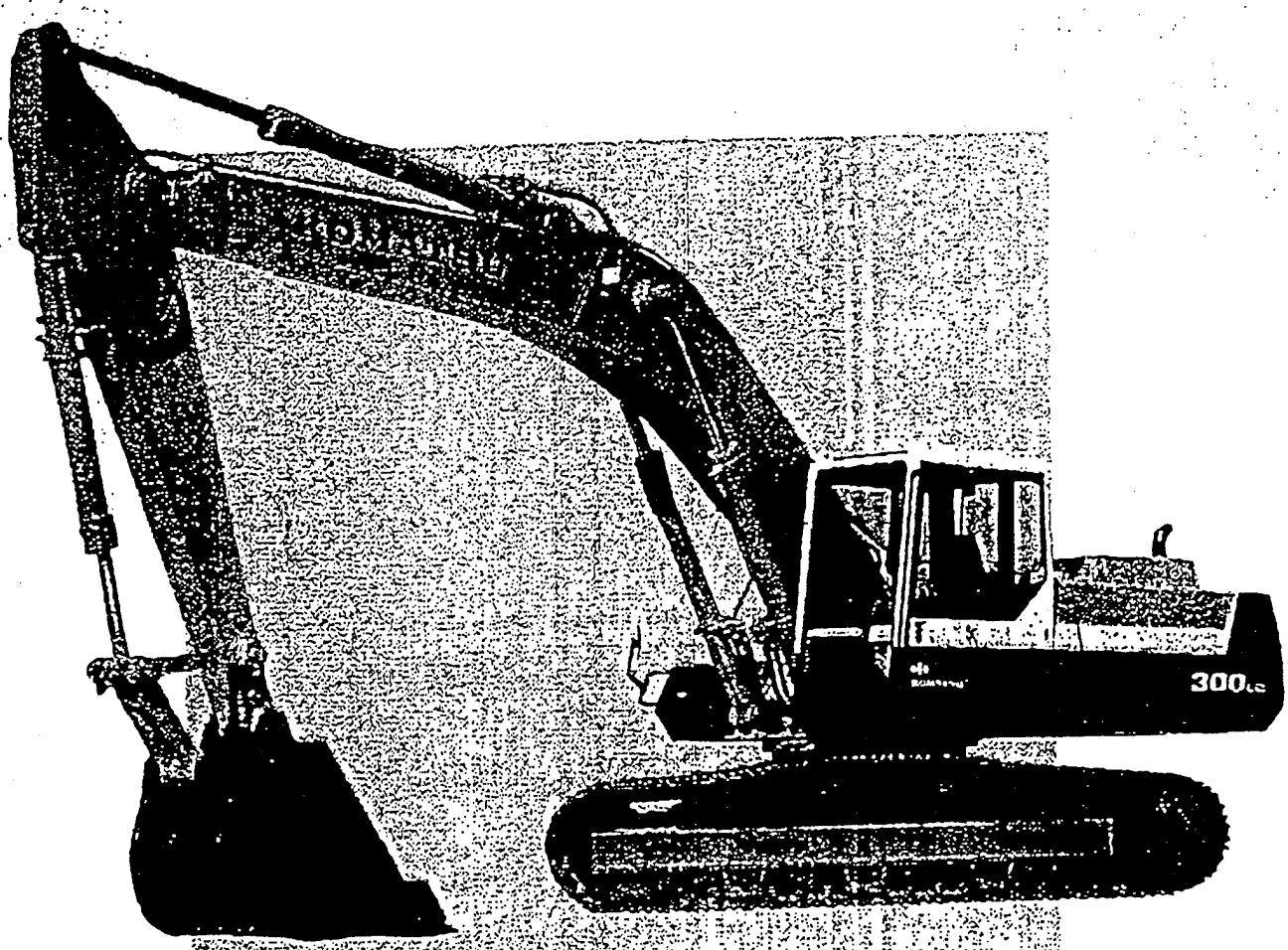


Typical Cross Section of Bioremediation Cell

Unico Construction Co P.O. Box 10105 San Antonio, Texas 78201 210/736-1693	Michigan Air National Guard Bioremediation Cell Detail Alpena Combat Readiness Training Center		SHEET 1 OF 1 SHEET

APPENDIX D

KOMATSU
PC300LC-5
HYDRAULIC EXCAVATOR



Flywheel Horsepower:
207 HP (155 kW) @ 2000RPM
Komatsu Dresser Powered

Operating Weight:
31200 kg (68,790 lb)

Bucket Capacity:
0.76-1.91 m³ (1.00 - 2.50 yd³)

Photos shown may include optional equipment.

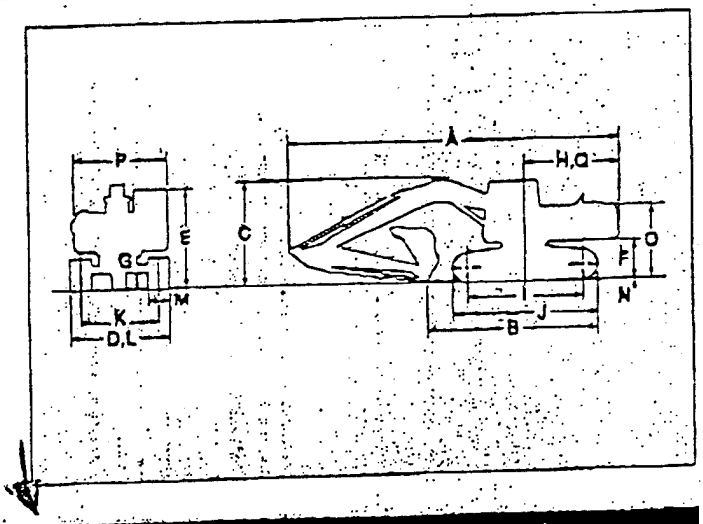
KOMATSU

DIMENSIONS

PC 300

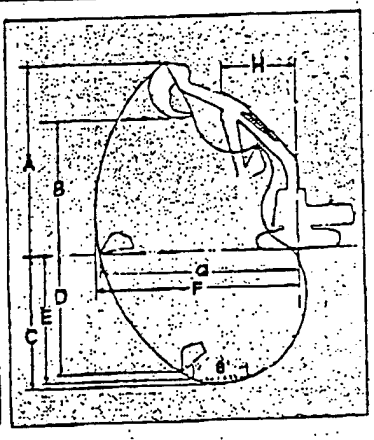
		2.2 m (7'3") arm	2.55 m (8'4") arm	3.19 m (10'5") arm	4.02 m (13'2") arm
A	Overall length	10950 mm (35'11")	10855 mm (35'7")	10810 mm (35'6")	10840 mm (35'7")
B	Length on ground (transport)	7728 mm (25'4")	6850 mm (22'6")	5405 mm (17'9")	5390 mm (17'8")
C	Overall height (to top of boom)	9370 mm (11'3")	3425 mm (11'3")	3200 mm (10'6")	3650 mm (12')

D	Overall width	3290 mm (10'10")
E	Overall height (to top of cab)	3060 mm (10')
F	Ground clearance, counterweight	1180 mm (3'10")
G	Min. ground clearance	498 mm (1'8")
H	Tail swing radius	3295 mm (10'7")
I	Length of track on ground	3945 mm (12'11")
J	Track length	4855 mm (15'11")
K	Track gauge	2590 mm (8'6")
L	Width of crawler	3290 mm (10'10")
M	Shoe width	700 mm (28")
N	Grouser height	31 mm (1.2")
O	Machine cab height	2495 mm (8'2")
P	Machine cab width	2960 mm (9'9")
Q	Distance, swing center to rear end	3150 mm (10'4")



WORKING RANGE

		2.2 m (7'3") arm	2.55 m (8'4") arm	3.19 m (10'5") arm	4.02 m (13'2") arm
A	Max. digging height	9580 mm (31'5")	9965 mm (32'8")	10210 mm (33'6")	10550 mm (34'7")
B	Max. dumping height	6595 mm (21'8")	6885 mm (22'7")	7110 mm (23'4")	7490 mm (24'7")
C	Max. digging depth	6355 mm (20'10")	6705 mm (22')	7380 mm (24'3")	8180 mm (26'10")
D	Max. vertical wall digging depth	5120 mm (16'10")	5880 mm (19'4")	6480 mm (21'3")	7280 mm (23'11")
E	Max. digging depth of cut for 8' level	6130 mm (20'1")	6520 mm (21'5")	7180 mm (23'7")	8045 mm (26'5")
F	Max. digging reach	10155 mm (33'4")	10550 mm (34'7")	11100 mm (36'5")	11900 mm (39'1")
G	Max. digging reach at ground level	9950 mm (32'8")	10355 mm (34')	10920 mm (35'10")	11730 mm (38'6")
H	Min. swing radius	4330 mm (14'2")	4345 mm (14'3")	4260 mm (14')	4280 mm (14'1")
Rated digging force		18800 kg (41,450 lb/184 kN)	18800 kg (41,450 lb/184 kN)	18800 kg (41,450 lb/184 kN)	18800 kg (41,450 lb/184 kN)
Arm crowd force		19100 kg (42,110 lb/187 kN)	16700 kg (36,820 lb/164 kN)	14100 kg (31,080 lb/138 kN)	12100 kg (26,680 lb/119 kN)



BUCKETS

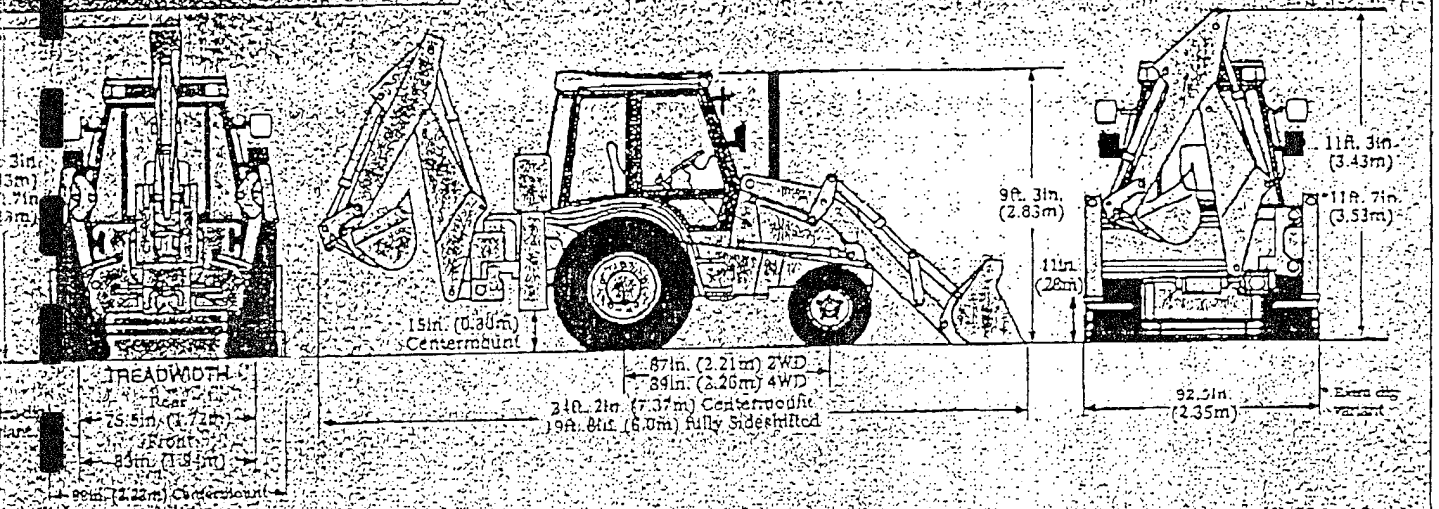
TYPE	Capacity m³ (yd³) SAE, PCSA heaped	Width mm (in) Outside Lip	Width mm (in) With side cutters (Komatsu) With wear shrouds (ESCO)	Weight Kg (lb)	No. of Teeth	ARMS 2.2 m (7'3")	2.55 m (8'4")	3.19 m (10'5")	4.02 m (13'2")
KOMATSU Mid-Heavy Duty	0.86 (1.13)	710 (28)	815 (32)	930 (2,118)	4	○	○	○	○
	1.06 (1.38)	840 (33)	940 (37)	1040 (2,356)	4	○	○	○	○
	1.25 (1.63)	965 (38)	1145 (45)	1145 (2,600)	5	○	○	○	○
ESCO STDP	0.96 (1.25)	760 (30)	815 (32)	1027 (2,284)	4	○	○	○	○
	1.15 (1.50)	915 (36)	965 (38)	1104 (2,435)	4	○	○	○	○
	1.44 (1.88)	1065 (42)	1120 (44)	1221 (2,691)	5	○	○	○	○
	1.62 (2.12)	1220 (48)	1270 (50)	1300 (2,865)	5	○	□	△	□
	1.91 (2.50)	1370 (54)	1420 (56)	1433 (3,160)	6	○	○	△	X
ESCO HDP	0.96 (1.25)	760 (30)	815 (32)	1256 (2,768)	4	○	○	○	○
	1.15 (1.50)	915 (36)	965 (38)	1364 (3,008)	4	○	○	○	△
	1.44 (1.88)	1065 (42)	1120 (44)	1511 (3,331)	5	○	○	○	X
	1.62 (2.12)	1220 (48)	1270 (50)	1620 (3,571)	5	○	□	△	X
	1.91 (2.50)	1370 (54)	1420 (56)	1780 (3,925)	6	○	○	△	X
ESCO HDC	0.76 (1.00)	710 (28)	812 (32)	1063 (2,344)	4	○	○	○	○
	0.96 (1.25)	840 (33)	940 (37)	1192 (2,627)	4	○	○	○	○
	1.06 (1.38)	990 (39)	1092 (43)	1239 (2,732)	4	○	○	○	○
	1.44 (1.88)	1145 (45)	1245 (49)	1425 (3,141)	5	○	○	□	X

○ - Can be used with a material weight up to 3,040 lb/yd³
□ - Can be used with a material weight up to 2,520 lb/yd³
△ - Can be used with a material weight up to 2,020/yd³
X - Not useable

54'

ERAL SPECIFICATION

STATIC DIMENSIONS



The dimensional and operational specifications are based on 2WD unit equipped with 11.00 x 16SL x 12 ply ribbed front tires, 19.5L x 24 x 10 ply industrial Rear tires 1.0 cu. yd. Loader Bucket, 24in. (610mm) Backhoe bucket and all other standard equipment. Machine in travel position.

ENGINE

...ed power unit mounted in an ...ed on resilient mountings. Power ...d through torque converter and JCB ...shuttle transmission to JCB torque ...ing axle by a drive shaft. Powertrain ...by Audio Visual Monitoring System.

...ecifications:

	2WD	4WD
...ufacturer	Perkins	Perkins
Ma...	1004.4 T/R	1004 T/R
...placement	243cu.in. (4 liters)	
...mber of cylinders	4	
...e and stroke	3.93 x 5.00in.	
	(100mm x 127mm)	
...e	4	
...ration	Natural (2WD)	
	Turbocharged (4WD)	
...mpression ratio	16.5:1	
...n bearings	5	
...ed power:	2WD	4WD
...Gross	74 @ 2,200 rpm	80 @ 2,200 rpm
	(55.5kW)	(60kW)
...Net	70 @ 2,200 rpm	85 @ 2,200 rpm
	(52.5kW)	(63.8kW)
...x Torque:	2WD	4WD
...Gross	208lb.ft.	240lb.ft.
	(283Nm)	(325Nm)
	@ 1,200 rpm	@ 1,400 rpm
...Net	203lb.ft.	231lb.ft.
	(275Nm)	(313Nm)
	@ 1,200 rpm	@ 1,400 rpm

...el, lubrication and cooling systems:

...el capacity	2 Diesel
...el filter	Single stage, 5 micron replaceable cartridge and water separator
...el supply	Direct injection from rotary injection pump
...cleaner	Dry cyclonic replaceable element with safety filter
...filter	Full flow, spin on cartridge
...brication	Positive pressure
...oling system	Liquid, pressurized 7psi (0.5 bar)
...n	Suction

TRANSMISSION

Type	JCB Synchro Shuttle
Speeds Forward/Reverse	4
Synchronized	All gears
Selection	Hand lever
Disconnect	Foot pedal and hand operated button

Gear Ratios:

Forward	Reverse
1st-8.55:1 2nd-4.06:1	1st-6.55:1 2nd-4.06:1
3rd-1.89:1 4th-1.00:1	3rd-1.89:1 4th-1.00:1

Torque converter:

Type	Single stage, dual phase hydrokinetic
Size	11in. (280mm)
Stall ratio	2.8:1 (2WD) 2.4:1 (4WD)

AXLES

Rear Drive:

Type	JCB Torque Proportioning differential
Final drive	Outboard planetary

Ratios:	Ratings:
Primary: 2.92:1	Static: 55,125lbs. (25,000kgs.)
Final: 5.40:1	Dynamic: 27,562lbs.
Overall: 15.78:1	(12,500kgs.)

Front axles:

Type	JCB Torque Proportioning differential
Final drive	Outboard planetary
Ratios: Primary: 3.55:1	
Final: 5.40:1	
Overall: 19.21:1	

Oscillation angle: +/- 8°
Steer angle: +/- 43°

Steer ram: Double acting
Ratings: Static: 36,383lbs. (16,500kgs.)
Dynamic: 18,300lbs. (8,300kgs.)

TRAVEL SPEEDS

19.5L-24 10PR and engine at 2,200rpm

Forward	Reverse
1st-3.14mph (5.05kph)	1st-3.14mph (5.05kph)
2nd-5.06mph (8.15kph)	2nd-5.06mph (8.15kph)
3rd-10.89mph (17.52kph)	3rd-10.89mph (17.52kph)
4th-20.57mph (33.11kph)	4th-20.57mph (33.11kph)

BRAKES

Effective and fade free braking, the JCB braking system is a self-adjusting, multi-disc arrangement that is mounted inboard and is fully immersed for long life and cool operation. Automatically switches from 2WD to 4WD for effective transmission braking on 4WD machines.

Service brake - type	Hydraulically actuated, fully enclosed, oil immersed
Operation	2 foot pedals for independent or simultaneous operation
Diameter	8.7in. (221mm)
Friction area per brake	200sq.in. (0.13m²)
Parking brake type	Calliper disc on drive shaft
Operation	Independent of the service brakes by hand lever
Diameter	11in. (280mm)
Friction area per brake	8.4sq.in. (5418sq.mm)

ELECTRICS

Heavy duty wiring harness with woven nylon outer covering and secured every 10 inches to protect against abrasion. All connectors conform to IP67 (DIN 40 050) standards for protection against both water and dust.

System	12 volt
Battery	120 amp hour 780 cold cranking amps @ 32 deg. F (0 deg. C)
BCI Group	31
Alternator	65 Amps

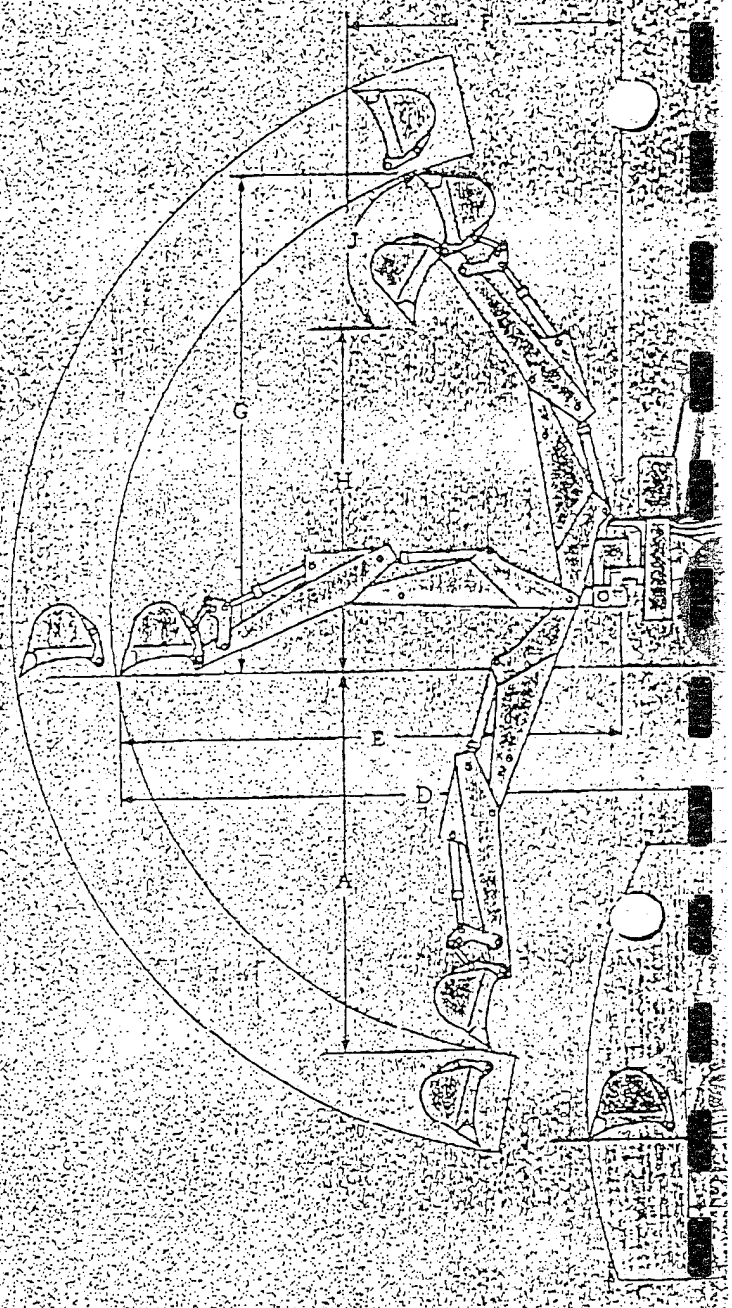
ACKHOE SPECIFICATION

BACKHOE DIMENSIONS

Backhoe operating data (SAE) (Machine equipped with 24in. (610mm) bucket)	Std/B-hoe	Extradig Retracted	Extradig Extended	Long Dipper
	ft.-in. (m)	ft.-in. (m)	ft.-in. (m)	ft.-in. (m)
A – SAE Dig depth	14-5 (4.39)	14-0 (4.27)	17-10 (5.44)	15-1 (4.60)
SAE 2ft. (610mm) flat bottom	14-4 (4.37)	13-11 (4.24)	17-9 (5.41)	15-0 (4.57)
B – Reach (CM) over the side from stabilizer	11-6 (3.51)	11-2 (3.40)	14-9 (4.50)	–
Reach (SS) over the side from stabilizer	15-9 (4.80)	15-4 (4.67)	18-11 (5.77)	–
C – Reach from swing pivot centreline	17-8 (5.38)	17-4 (5.28)	20-11 (6.36)	18-7 (5.66)
D – Reach from rear axle centerline	22-0 (6.71)	21-7 (6.58)	25-2 (7.67)	22-11 (6.99)
E – Reach from swing pivot centerline	17-8 (5.38)	17-4 (5.28)	20-11 (6.36)	18-7 (5.66)
F – Reach at full height to swing center	5-4 (1.63)	4-10 (1.47)	8-2 (2.49)	–
G – Height max. fully raised	17-7 (5.63)	17-0 (5.18)	19-4 (5.38)	–
H – Loading height clearance	10-10 (3.30)	11-7 (3.53)	13-10 (4.22)	11-2 (3.40)
I – Stabilizer spread Centermount	12-2 (3.71)			
Overall width	10-1 (3.07)			
I – (1) – Pin center to pin center Sideshift	7-8 (2.35)			
Overall width				
J – Bucket rotation	201°			
Speed	185°			
Power				

BACKHOE PERFORMANCE

Digging Force – SAE:	lbs. (kgs.)	lbs. (kgs.)	lbs. (kgs.)	lbs. (kgs.)
Bucket cylinder	9,930 (4,504)	9,350 (4,468)	9,850 (4,468)	11,000 (4,990)
Speed	11,450 (5,194)	11,300 (5,126)	11,300 (5,126)	12,700 (5,760)
Power				
Dipper cylinder	6,490 (2,944)	6,545 (2,969)	4,560 (2,068)	5,950 (2,698)
Swing arc	180°			
Leveling angle – max. grade backhoe will dig vertical cut	15°			
Centermount	6.3°			
Sideshift				
Swing torque:	21,000 (28.5kNm)			
Centermount	9,711 (13.18kNm)			
Sideshift				



BACKHOE BUCKETS

Standard Buckets

Width in. (mm)	Capacity SAE Heaped cu.ft. (m³)	Capacity SAE Struck cu.ft. (m³)	Weight (+ Teeth) lbs. (kgs.)	Teeth
12 (305)	2.2 (.06)	2.1 (.06)	175 (79)	3
16 (406)	3.8 (.09)	3.0 (.08)	200 (91)	3
18 (457)	4.3 (.12)	3.0 (.08)	225 (102)	3
24 (610)	6.0 (.16)	4.5 (.12)	310 (141)	4
*24 (610)	8.0 (.22)	6.3 (.17)	314 (142)	4
30 (762)	8.5 (.23)	6.0 (.16)	355 (161)	5
36 (914)	10.5 (.29)	7.3 (.20)	435 (197)	5

*Deep Profile

Heavy Duty Buckets

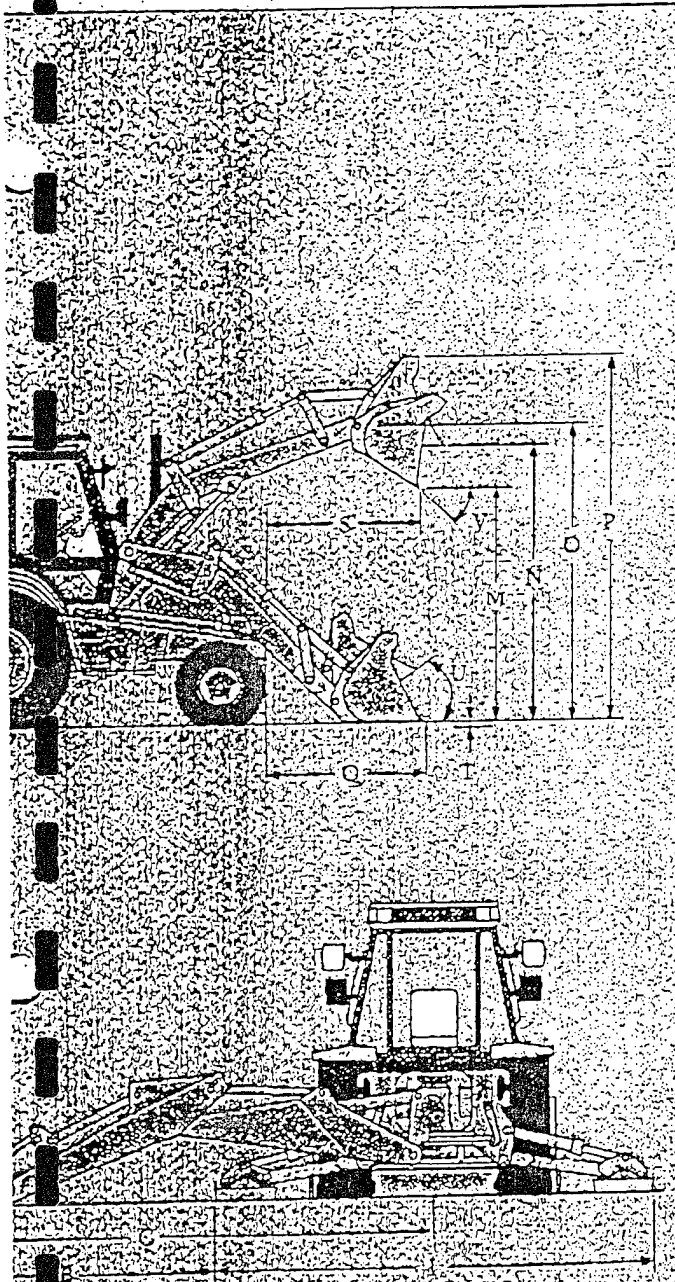
Width in. (mm)	Capacity SAE Heaped cu.ft. (m³)	Capacity SAE Struck cu.ft. (m³)	Weight (+ Teeth) lbs. (kgs.)	Teeth
18 (457)	4.5 (.12)	4.4 (.12)	250 (113)	3
24 (610)	6.9 (.19)	6.0 (.16)	310 (141)	4
30 (762)	9.0 (.25)	7.7 (.21)	375 (170)	5
36 (914)	11.2 (.32)	9.4 (.27)	420 (190)	6

Heavy Duty, High Capacity Buckets

Width in. (mm)	Capacity SAE Heaped cu.ft. (m³)	Capacity SAE Struck cu.ft. (m³)	Weight (+ Teeth) lbs. (kgs.)	Teeth
18 (457)	5.6 (.15)	5.2 (.14)	285 (129)	3
24 (610)	7.7 (.21)	7.2 (.20)	330 (150)	4
30 (762)	10.5 (.29)	9.2 (.25)	400 (181)	5
36 (914)	13.0 (.31)	11.2 (.32)	450 (204)	6

CB214

LOADER SPECIFICATION



LOADER DIMENSIONS

	GP Bucket ft. in. (m)	Multi-Purpose Bucket ft. in. (m)
M – Clearance at 45 deg. dump	8-8 (2.65)	8-9 (2.66)
N – Loadover height	10-4 (3.16)	10-3 (3.14)
O – Bucket hinge pin height	11-1 (3.38)	11-1 (3.38)
P – Maximum operating height	13-2 (4.01)	–
Q – Reach at ground (bucket on ground)	4-9 (1.45)	4-7 (1.40)
S – Reach at 45 deg. dump	2-9 (.84)	2-7 (.79)
T – Dig depth (Bucket flat)	0-5 (.14)	0-5 (.14)
U – Rollback at ground level	45°	45°.
V – Max. dump angle	45°	53°.

LOADER PERFORMANCE

	lbs. (kgs.)	lbs. (kgs.)
Bucket breakout force	12,000 (5,442)	13,100 (5,941)
Loader arm breakout force	11,100 (5,034)	10,200 (4,626)
Lift capacity to full height	6,750 (3,061)	6,100 (2,767)
Clamp force	–	6,486 (2,942)

Note: Multi-purpose bucket jaw opening width – 3ft. 1in. (.94m)

LOADER CYCLE TIMES AT 2,200 RPM

Loader arm raised to full height	3.7 seconds
Bucket dump	1.89 seconds
Loader arm lower – power down	2.4 seconds
Arms lowered – Return-to-dig	3.0 seconds
Bucket tollback	1.4 seconds

Special Purpose Buckets – Hydraulic Jaw Buckets

Width in. (mm)	Capacity SAE Heaped cu.ft. (m³)	Capacity SAE Struck cu.ft. (m³)	Weight (+ Teeth) lbs. (kgs.)	Teeth
18 (457)	5.0 (.14)	4.0 (.11)	560 (254)	4
24 (610)	7.0 (.19)	6.0 (.16)	620 (281)	4

Special Purpose Buckets – Tapered Ditching Buckets

Width ft. in. (mm)	Capacity SAE Heaped cu.ft. (m³)	Capacity SAE Struck cu.ft. (m³)	Weight (+ Teeth) lbs. (kgs.)	Teeth
Ditching 66x15 (1,676x381)	2.3 (.06)	–	450 (204)	2
60 deg. 42x12 (1,067x305)	4.0 (.11)	–	221 (100)	2

LOADER BUCKETS

Standard – General Purpose Bucket

Width ft. in. (mm)	Capacity SAE Heaped Yd.³ (m³)	Capacity SAE Struck Yd.³ (m³)
88 (2,335)	1.1 (1.0)	1.0 (.83)

Optional – Multi Purpose Bucket

Width ft. in. (mm)	Capacity SAE Heaped Yd.³ (m³)	Capacity SAE Struck Yd.³ (m³)
88 (2,335)	1.1 (.90)	.95 (.73)

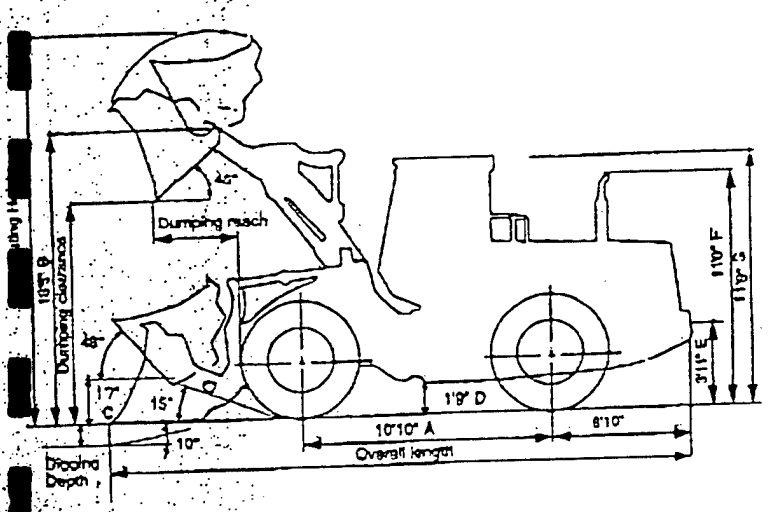
KOMATSU
WA420-1
WHEEL LOADER

Flywheel Horsepower @ 2200 RPM	224 HP	167 kW
Operating Weight	41,733 lb	18,930 kg
Bucket Capacities	4.0-6.0 yd³	3.1-4.6 m³

Photo shown may include optional equipment

KOMATSU

WA 420



	Tires	26.5-25-20PR (L3)	
	Tread	7'3"	2200mm
	Width over tires	9'6"	2890mm
A	Wheelbase	10'10"	3300mm
B	Hinge pin height, max. height	13'5"	4085mm
C	Hinge pin height, carry position	1'7"	475mm
D	Ground clearance	1'9"	525mm
E	Hitch height	3'11"	1185mm
F	Overall height, top of the stack	11'0"	3360mm
G	Overall height, ROPS canopy	11'9"	3575mm

Bucket Type		Standard Boom: General Purpose, Bolt-on Cutting Edge		Standard Boom: Excavation, Bolt-on Cutting Edge		Standard Boom: Excavation, Teeth		High Lift Boom, Bolt-on Cutting Edge
Bucket Capacity	SAE Rated	4.75 yd³	3.7m³	4.25 yd³	3.3m³	4.00 yd³	3.1m³	[illegible]
	Struck	4.20 yd³	3.2m³	3.80 yd³	2.8m³	3.4 yd³	2.6m³	[illegible]
Bucket Width		10'0"	3050mm	10'0"	3050mm	10'0"	3050mm	[illegible]
Bucket Weight		3,730 lbs	1690kg	3,826 lbs	1730kg	3,736 lbs	1690kg	[illegible]
Static Tipping Loads	Straight	31,845 lbs	14,445kg	32,264 lbs	14,635kg	32,617 lbs	14,795kg	[illegible]
	Full Turn (40°)	27,558 lbs	12,500kg	28,142 lbs	12,765kg	28,283 lbs	12,820kg	[illegible]
Dumping Clearance, max. height and 45° dump angle		9'8"	2955mm	9'10"	3005mm	9'5"	2880mm	[illegible]
Reach @ 7' 2130 mm cutting edge clearance and 45° dump angle		5'0"	1540mm	4'11"	1485mm	5'1"	1550mm	[illegible]
Reach at max. height and 45° dump angle		3'5"	1040mm	3'2"	955mm	3'5"	1055mm	[illegible]
Height to hinge pin (fully raised)		13'5"	4085mm	13'5"	4085mm	13'5"	4065mm	[illegible]
Operating Height	(fully raised)	18'4"	5585mm	17'11"	5450mm	17'11"	5450mm	[illegible]
Overall Length	Bucket on ground	25'9"	7840mm	25'8"	7770mm	26'0"	7925mm	[illegible]
	Bucket at carry	25'0"	7615mm	25'5"	7755mm	25'10"	7875mm	[illegible]
Turning radius (bucket at carry, outside corner of bucket)		21'8"	6600mm	21'7"	6575mm	21'9"	6620mm	[illegible]
Digging Depth	0°	1.2"	30mm	2.2"	55mm	2.9"	75mm	[illegible]
	10°	10"	255mm	10.6"	270mm	1'0"	315mm	[illegible]
Breakout Force		40,025 lbs	18,155kg	42,480 lbs	19,260kg	46,020 lbs	20,875kg	[illegible]
Operating Weight		41,733 lbs	18,930kg	41,833 lbs	18,970kg	41,733 lbs	18,930kg	[illegible]

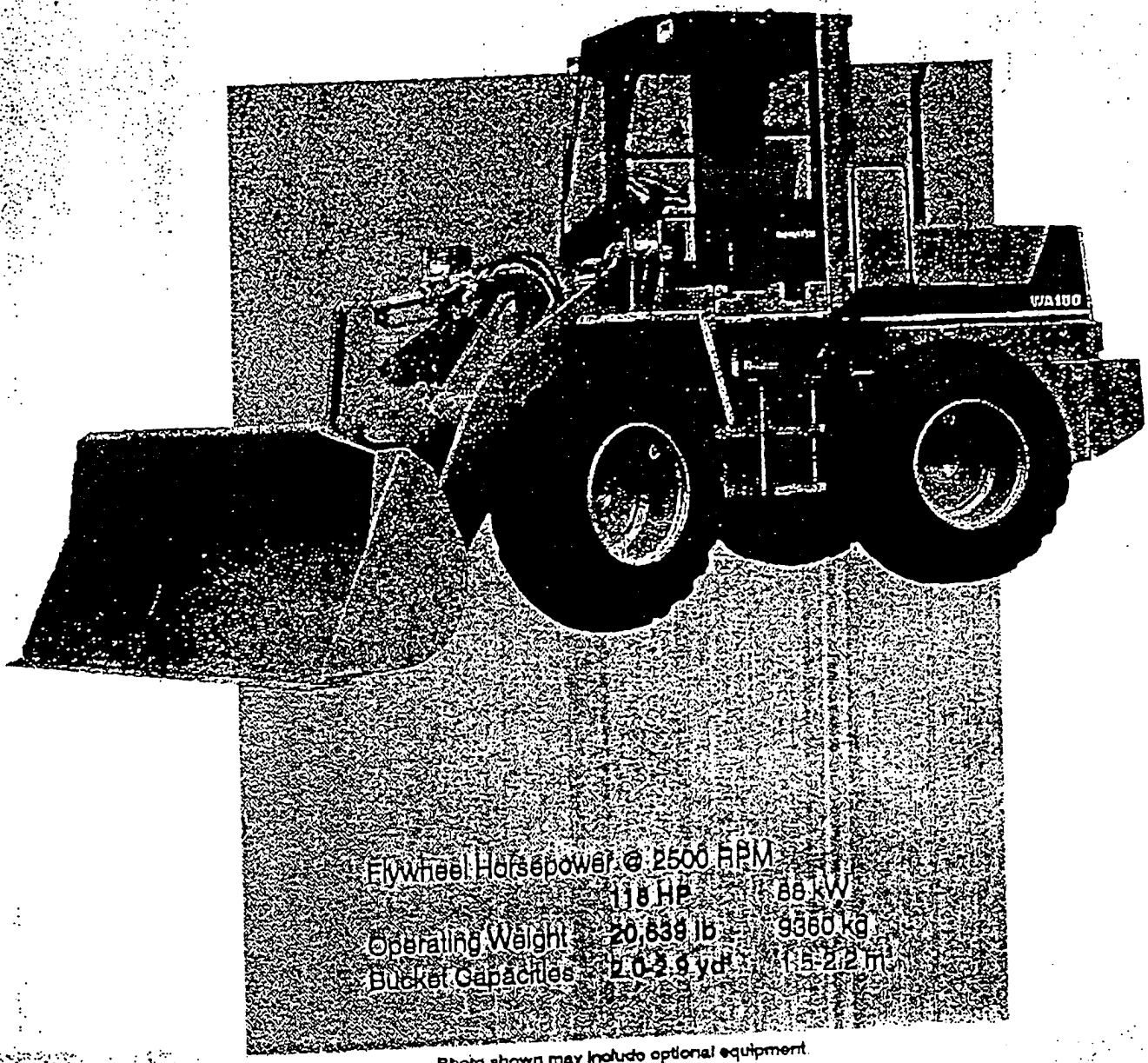
1. All dimensions, weights and performance values based on SAE J-732C and J-742B standards.
2. Material weight should not exceed 2500 lbs/cyd. for the above stated bucket on the high lift boom. If material weight does exceed 2500 lbs/cyd., bucket capacity must be derated.
3. Additional logging counterweight must be used with the high lift boom arrangement.

Static tipping load and operating weight shown include lubricants, coolant, full fuel tank, ROPS cab (option), front fenders, additional counterweight, 26.5-25-20PR (L3) tubeless tires and operator. Machine stability and operating weight are affected by counterweight, tire size and other attachments. Use either tire ballast or counterweight, not both. Add the following weight changes to operating weight and static tipping loads.

Weight Changes	Change in Operating Weight				Change in Static Tipping Load							
					Straight				Full Turn			
Tires & Options	No Ballast		Ballast		No Ballast		Ballast		No Ballast		Ballast	
23.5-25-16PR (L2)	-1,860 lbs	845 kg	-210 lbs*	95 kg	-1,555 lbs	705 kg	+595 lbs*	270 kg	-1,345 lbs	610 kg	+670 lbs*	305 kg
23.5-25-16PR (L3)	-1,080 lbs	475 kg	+605 lbs*	275 kg	-860 lbs	390 kg	+1,270 lbs*	575 kg	-760 lbs	345 kg	+1,255 lbs*	570 kg
23.5-25-20PR (L2)	-1,730 lbs	785 kg	-75 lbs*	35 kg	-1,420 lbs	645 kg	+705 lbs*	320 kg	-1,255 lbs	570 kg	+770 lbs*	350 kg
23.5-25-20PR (L3)	-1,925 lbs	665 kg	+630 lbs*	286 kg	-840 lbs	380 kg	+1,250 lbs*	580 kg	+740 lbs	336 kg	+1,250 lbs*	580 kg
26.5-25-16PR (L3)	-145 lbs	66 kg	+2,240 lbs**	1015 kg	-120 lbs	55 kg	+3,195 lbs**	1450 kg	-110 lbs	50 kg	+2,965 lbs**	1345 kg
26.5-25-20PR (L3)	0		+2,280 lbs**	1060 kg	0		+3,320 lbs**	1505 kg	0		+3,968 lbs**	1390 kg
Additional Counterweight, removed	-880 lbs	300 kg			-1,675 lbs	760 kg			-1,320 lbs	600 kg		
ROPS Cab, removed	-1,045 lbs	475 kg			-1,145 lbs	520 kg			-1,670 lbs	485 kg		
Steel cab, removed	-630 lbs	285 kg			-560 lbs	255 kg			-105 lbs	245 kg		

*2215 lbs, 1050 kg ballast used instead of additional counterweight
**3040 lbs, 1380 kg ballast used instead of additional counterweight

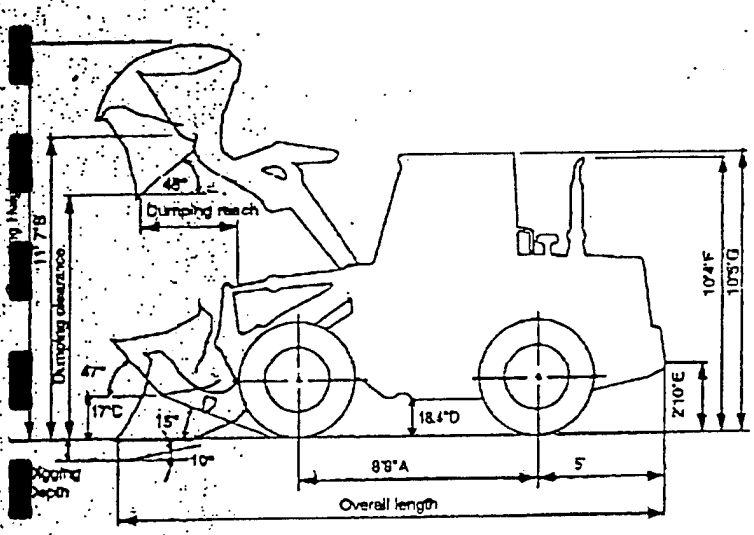
KOMATSU
WA 180-1
WHEEL LOADER



Flywheel Horsepower @ 2500 RPM	118 HP	88 kW
Operating Weight	20,639 lb	9360 kg
Bucket Capacities	2.0-2.9 yd³	1.5-2.2 m³

Photo shown may include optional equipment

KOMATSU



	Tires	17.5-25-12 PR (L2)	
	Tread	6'4"	1930 mm
	Width over tires	7'9"	2362 mm
A	Wheelbase	8'8"	2641 mm
B	Hinge pin height, max. height	11'7"	3530 mm
C	Hinge pin height, carry position	17"	432 mm
D	Ground clearance	18.4"	467 mm
E	Hitch height	2'10"	883 mm
F	Overall height, top of the stack	10'4"	3149 mm
G	Overall height, ROPS canopy	10'6"	3175 mm

Bucket Type		General Purpose Bolt-on Cutting Edge		Excavating Bolt-On Cutting Edge		Light Material Bolt-On Cutting Edge	
Bucket Capacity	SAE Rated	2.25 yd³	1.7m³	2.0 yd³	1.5 m³	2.9 yd³	2.2 m³
	Struck	2.0 yd³	1.5 m³	1.7 yd³	1.3 m³	2.5 yd³	1.9 m³
Bucket Width		8'0"	2440 mm	8'0"	2440 mm	8'0"	2440 mm
Bucket Weight		1710 lbs	775 kg	1580 lbs	715 kg	1670 lbs	757 kg
Static Tipping Loads	Straight	15,435 lbs	7000 kg	15,545 lbs	7050 kg	14,972 lbs	6790 kg
	Full Turn	13,395 lbs	6075 kg	13,528 lbs	6135 kg	13,021 lbs	5905 kg
Dumping Clearance, max. height and 45° dump angle		8'11"	2710 mm	9'0"	2750 mm	8'6"	2595 mm
Reach @ 7' 2130 mm cutting edge height and 45° dump angle		4'5"	1350 mm	4'4"	1330 mm	4'7"	1400 mm
Reach at max. height and 45° dump angle		3'3"	990 mm	3'1"	950 mm	3'8"	1105 mm
Reach with arm horizontal and bucket level		6'8"	2040 mm	6'6"	1980 mm	7'3"	2200 mm
Operating Height	(fully raised)	15'5"	4700 mm	15'3"	4640 mm	15'7"	4760 mm
Overall Length	Bucket ground	20'8"	6260 mm	20'4"	6200 mm	21'1"	6420 mm
	Bucket at carry	20'6"	6250 mm	20'4"	6185 mm	20'10"	6360 mm
Turning radius (bucket at carry, outside corner of bucket)		17'5"	5305 mm	17'4"	5290 mm	17'6"	5345 mm
Digging Depth	0°	3.1"	80 mm	3.1"	80 mm	3.1"	80 mm
	10°	9.8"	250 mm	9.4"	240 mm	10.8"	275 mm
Breakout Force		20,290 lbs	9200 kg	21,605 lbs	9890 kg	17,000 lbs	7710 kg
Operating Weight		20,639 lbs	9360 kg	20,595 lbs	9340 kg	20,870 lbs	9465 kg

1 All dimensions, weights and performance values based on SAE J-732C and J-742B standards.

• Static tipping load and operating weight shown include lubricants, coolant, full fuel tank ROPS cab (option), 17.5 - 25, 12PR (L2) tires, additional counterweight, front fenders and operator. Machine stability and operating weight are affected by counterweight, tire size and other attachments. Add the following weight changes to operating weight and static tipping loads.

Weight Changes

Tires & Options	Change in Operating Weight		Change in tipping load			
			Straight		Full Turn	
Additional Counterweight (removed)	-680 lbs	-310 kg	-1200 lbs	-545 kg	-1050 lbs	-475 kg
ROPS Cab (removed)	-882 lbs	-400 kg	-684 lbs	-310 kg	-595 lbs	-270 kg
ROPS Canopy (instead of ROPS Cab)	-430 lbs	-195 kg	-331 lbs	-150 kg	-287 lbs	-130 kg
Bucket Teeth (instead of bolt-on cutting edge)	-99 lbs	-45 kg	+143 lbs	+65 kg	+143 lbs	+65 kg
15.5-25-12PR (L2) tubeless tires	-232 lbs	-105 kg	-176 lbs	-80 kg	-154 lbs	-70 kg
15.5-25-12PR (L3) tubeless tires	-11 lbs	-5 kg	-11 lbs	-5 kg	-11 lbs	-5 kg
17.5-25-12PR (L2) tubeless tires	0		0		0	
17.5-25-12PR (L3) tubeless tires	+178 lbs	+80 kg	+132 lbs	+60 kg	+110 lbs	+50 kg

COOPER

EQUIPMENT COMPANY

17474 Judson Rd. San Antonio, Tx. 78247-4629
Phone: (210) 657-5151 Fax: (210) 657-5871

April 10, 1995

To: Dave Neuman

Fax: 661-6060

From: George Cooper

Remarks:

As per request, here is some information related to reduced air emissions using the Cooper Sprayer.

The shredder chamber is enclosed. The discharge is hit immediately with the heavy atomized spray stream. The discharge area is enclosed on both sides and top by shielding. The air stream follows the particle and spray stream allowing the spray enhanced ability to knock out air pollutants.

If emissions are too much of a problem, it seems logical that a tarp system could be added to fully contain the discharged stream and pile.

Good luck on obtaining the contract.

We look forward to seeing ya'll next week.

Best regards,

George A. Cooper, Pres.

US005342146A

United States Patent [19]

Cooper

[11] Patent Number: 5,342,146

[45] Date of Patent: * Aug. 30, 1994

[54] METHOD AND APPARATUS FOR TREATMENT OF CONTAMINATED SOIL PARTICLES

[75] Inventor: George A. Cooper, San Antonio, Tex.

[73] Assignee: Cooper Equipment Company, San Antonio, Tex.

[*] Notice: The portion of the term of this patent subsequent to Aug. 3, 2010 has been disclaimed.

[21] Appl. No.: 121,278

[22] Filed: Sep. 14, 1993

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 2,760, Jan. 12, 1993, Pat. No. 5,271,694.

[51] Int. Cl.[5] B09B 3/00; E02D 3/12

[52] U.S. Cl. 405/128; 405/258

[58] Field of Search 405/258, 128, 129, 263, 405/264; 110/246, 346, 347

[56] References Cited

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5,024,770	6/1991	Boyd et al.	210/747
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Primary Examiner—Dennis L. Taylor

Attorney, Agent, or Firm—Cox & Smith Incorporated

[57] ABSTRACT

A method and apparatus for decontaminating hydrocarbon contaminated soil particles comprises an upwardly directed conveyor which passes the soil through shredding knives to breakup the soil into a plurality of particles having a preselected maximum size. The stream of particles are directed against a downwardly inclined deflector to be directed downwardly toward a ground or concrete surface to form a growing conical pile of contaminated soil particles. A first set of spray nozzles, located above the particle stream, directs a spray of water containing decontaminating agents into the contaminated soil particle stream generally parallel to and within the stream of the contaminated soil particles, thus moistening the particles and assisting in producing a rolling action of the particles down the sides of the growing conical pile of particles. A second spray is utilized to direct a stream of water containing decontaminating agents against the underside of the stream of soil particles and the two sets of sprays provide a effective water barrier against the release into the atmosphere of aromatic materials carried by the contaminated soil particles.

13 Claims, 11 Drawing Sheets

described in connection with FIGS. 1–6, would also be utilized in the modification of FIGS. 7–9.

A further improvement of this invention constitutes the establishment of a water barrier within and surrounding the stream of contaminated soil particles to prevent the discharge into the atmosphere of aromatics that may be intermixed with the soil particles.

A pair of brackets 40, of which only one is shown, are secured by bolts 40a to the forward end of the shredding chamber 4 in forwardly projecting relationship and disposed on each side of the soil particle conveyor 26. A cross-plate 42 is rigidly supported by brackets 40 and provides a mounting for a plurality of nozzles 50, disposed in a generally rectangular grid relationship and supplied by pipes 34 and conventional control valves (not shown) with pressured water containing the decontaminating agents. The nozzles 50 are positioned to impact against the lower side of the stream of particles P and cooperate with the sprays from nozzles 30 to provide an effective saturation of the particle stream to prevent any significant discharge of aromatic hydrocarbons contained in the stream of soil particles.

It is therefore readily apparent to those skilled in the art that the method and apparatus of this invention provides an optimum system for effecting hydrocarbon, chemical or biological decontamination of contaminated soil particles. Modifications of this invention will be readily apparent to those skilled in the art and it is intended that all such modifications be included within the scope of the appended claims.

I claim:

1. The method of treating contaminated soil with an aqueous solution of decontaminating agents comprising:

breaking the contaminated soil into particles of substantially uniform maximum size;

forming a downwardly directed stream of contaminated soil particles impinging onto a selected surface in a manner to build a growing cone shaped mass of contaminated soil particles; and

concurrently directing a spray of an aqueous solution of decontaminating agents into said stream in a direction substantially parallel to and within said stream of contaminates soil particles, whereby a portion of said aqueous spray moistens said particles by contact therewith and the remainder of said aqueous spray contacts the upper portions of said growing pile to produce moistening of said growing pile and assist in rolling of newly deposited particles down the sides of said cone shaped mass to expose more of each particle's surface area to contact by said aqueous solution of decontaminating agents.

2. The method of claim 1 further comprising the step of:

continuously measuring the water content of said particles in said cone shaped mass; and

adjusting the flow rate of said downward discharge to maintain a selected minimum water content and a selected concentration of decontaminating agents in said growing cone shaped mass of contaminated soil particles.

3. The method of claim 2 further comprising the step of providing a plurality of adjustable flow rate, downwardly directed, horizontally spaced spray nozzles to apply said downward discharge of the aqueous solution of decontaminating agents; and

selectively adjusting the flow rates of said nozzles to maintain said selected minimum water content and concentration of decontaminating agents in said growing cone-shaped mass of contaminated soil particles.

4. The method of claim 3 further comprising the step of providing a computer;

measuring moisture content of said growing cone-shaped mass and entering signals in said computer representing said varying moisture content;

weighing the mass flow rate of said stream of particles and entering signals in said computer representing said mass flow rate; and

controlling the mass flow rate of said stream of contaminated particles and the flow rates of said nozzles by said computer to maintain a selected minimum moisture content in said growing cone shaped mass of contaminated particles.

5. The method of claim 4 further comprising the steps of utilizing said computer to indicate total mass of particles treated.

6. The method of claim 4 further comprising the steps of utilizing said computer to indicate total gallonage of decontaminating solution applied.

7. The method of claim 1 further comprising the step of directing a second spray of said aqueous solution of decontaminating agents to impinge on the lower side of said stream of contaminated soil particles and cooperating with said first mentioned spray to form a water barrier surrounding said stream of contaminated particles to minimize the release into the atmosphere of aromatics attached to said contaminated soil particles.

Reduced Air Emissions Claim

8. Apparatus for decontaminating soil contaminated by environmentally undesirable chemicals comprising, in combination,

means for shredding the contaminated soil into particles of substantially uniform maximum size;

means for conveying the contaminated soil particles at a selected rate to an overhead position relative to a non-contaminated surface;

means for discharging said contaminated soil particles in a stream from said overhead position to form a growing cone-shaped mass of contaminated particles on said non-contaminated surface;

means for directing a spray of an aqueous solution of decontaminating agents into said downwardly directed stream of contaminated particles in a direction substantially parallel to and within said stream of contaminated particles;

thereby wetting said particles and assisting in downward rolling movement of particles down the sides of said conical pile to expose more of the surfaces of said contaminated soil particles to contact with said aqueous solution.

9. Apparatus for decontaminating soil contaminated by environmentally undesirable chemicals comprising, in combination,

means for shredding the contaminated soil into particles of substantially uniform maximum size;

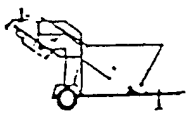
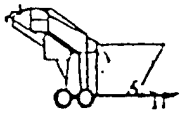
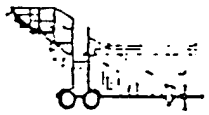
means for conveying the contaminated soil particles at a selected rate to an overhead position relative to a non-contaminated surface;

means for downwardly discharging a stream of said contaminated soil particles from said overhead position to form a growing cone-shaped mass of contaminated particles on said non-contaminated surface;

means for concurrently directing a spray of an aqueous solution of decontaminating agents substantially parallel to and within said stream of contam-

Royer Shredde

Specifications

MODELS	 300	 365	 401
Input processing rate (maximum to shredding belt)	75 cu. yds./hr. (60m³)	125 cu. yds./hr. (95m³)	200 cu. yds./hr. (153m³)
Overall dimensions L x W x H	20' x 6'6" x 10'6½" (6.1m x 1.98m x 3.21m)	23'6 x 8' x 12' (7.15m x 2.43m x 3.65m)	30'3" x 8' x 13'6" (9.21m x 2.43m x 4.12m)
Loading height	7'1" (2.15m)	8'2" (2.49m)	9' (2.74m)
Discharge height	8'8" (2.64m)	10'5" (3.17m)	12'8" (3.86m)
Hopper capacity (level)	2.34 cu. yds. (1.8m³)	4.4 cu. yds. (3.37m³)	9 cu. yds. (6.8m³)
Receiving hopper opening	6'6" x 5' (1.98m x 1.52m)	5'6" x 8' (1.67m x 2.43m)	7'4" x 12' (2.2m x 3.66m)
Recommended loader size	2 cu yds.	3 cu. yds.	5 cu. yds.
Feed conveyor width	20" (508mm)	30" (760mm)	30" (760mm)
Shredding belt (width and length)	26"W x 112"L (.66m x 2.84m)	36"W x 112"L (.91m x 2.84m)	36"W x 156"L (.91m x 3.96m)
res	two 7.60 x 15, 8-ply Implement	four 8.75 x 16.5, 10-ply Truck Load Range E	four 10 x 15 TR 14-ply Truck Load Range G
Power plant	173 cu. in. 3-cylinder, 4-cycle diesel engine. Mfr. rating—55 HP. Cont. oper.—45 HP.	268 cu. in. 4-cylinder, 4-cycle diesel engine. Mfr. rating—89 HP. Cont. oper.—72 HP.	250 cu. in. turbocharged, 4-cylinder, air-cooled, 4-cycle diesel engine. Mfr. rating—110 HP. Cont. oper.—90 HP.
Weight—(Approx. less options)	6,000 lbs. (2700 kg.)	9,200 lbs. (4175 kg.)	21,000 lbs. (9525 kg.)
Accessories			
Stone grate (Stationary)	Standard	Standard	Standard
Stone grate (Vibrating)	Not Available	Optional	Optional
Trash-Away conveyor	~~Optional~~ Std 12'L x 16"W	~~Optional~~ Std 12'L x 16"W	Standard 12'L x 16"W
Over-the-road package: Electric brakes; directional, stop and clearance lights; axles as needed	Optional	Optional	Air Brakes Standard. Light Package Optional.
Tires for highway travel	four 8.75 x 16.5, 10-ply Truck, Load Range E, Optional	four 8.75 x 16.5, 10-ply Truck, Load Range E, Standard	four 10 x 15 TR, 14-ply Truck, Load Range G, Standard
Hopper platform	Optional	Optional	Optional
mp breakers	Optional	Optional	Optional
Remote controls	~~Optional throttle control~~ Std	Optional throttle control	Optional start/stop switch

To implement its policy of continuous and specifications without notice.

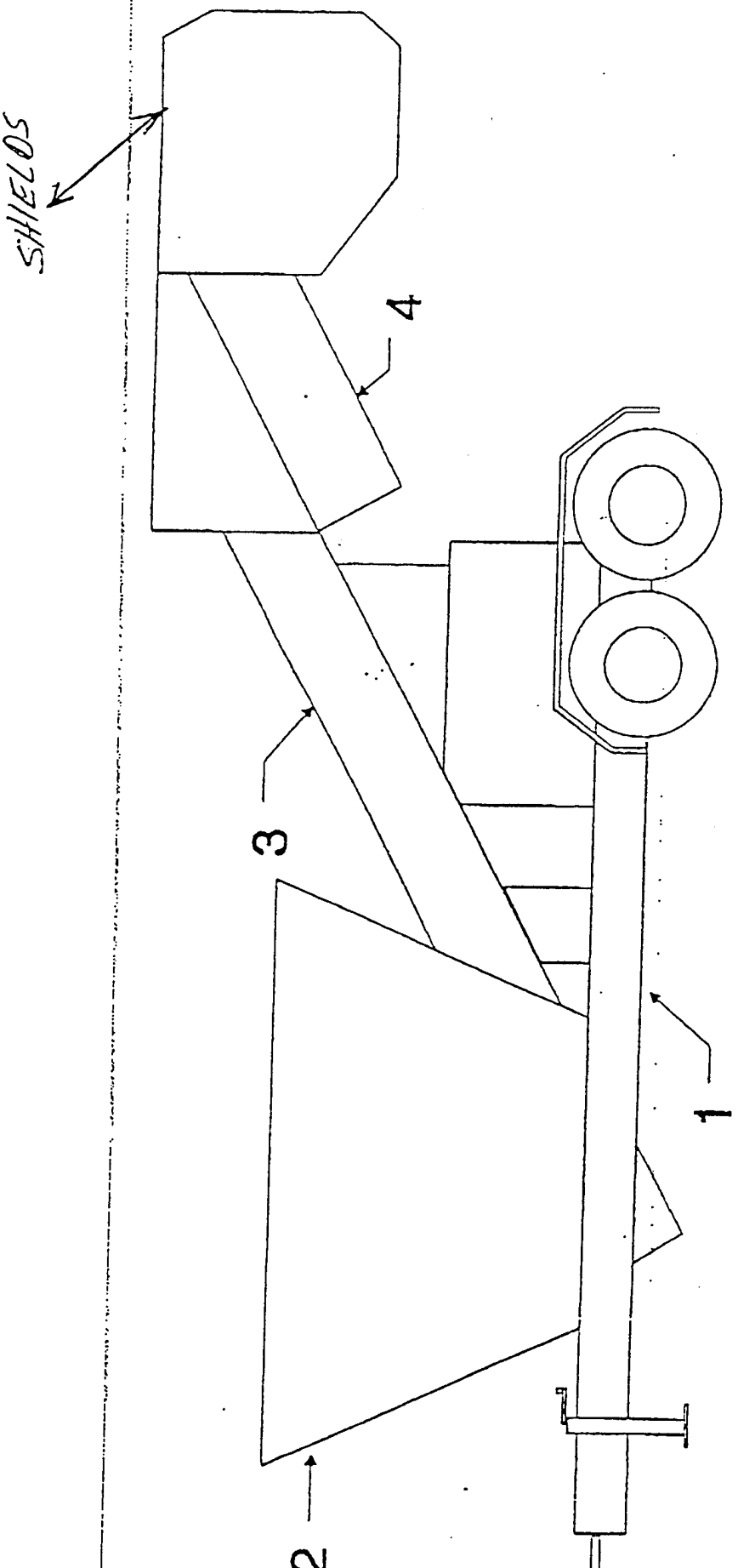


FIG. 1

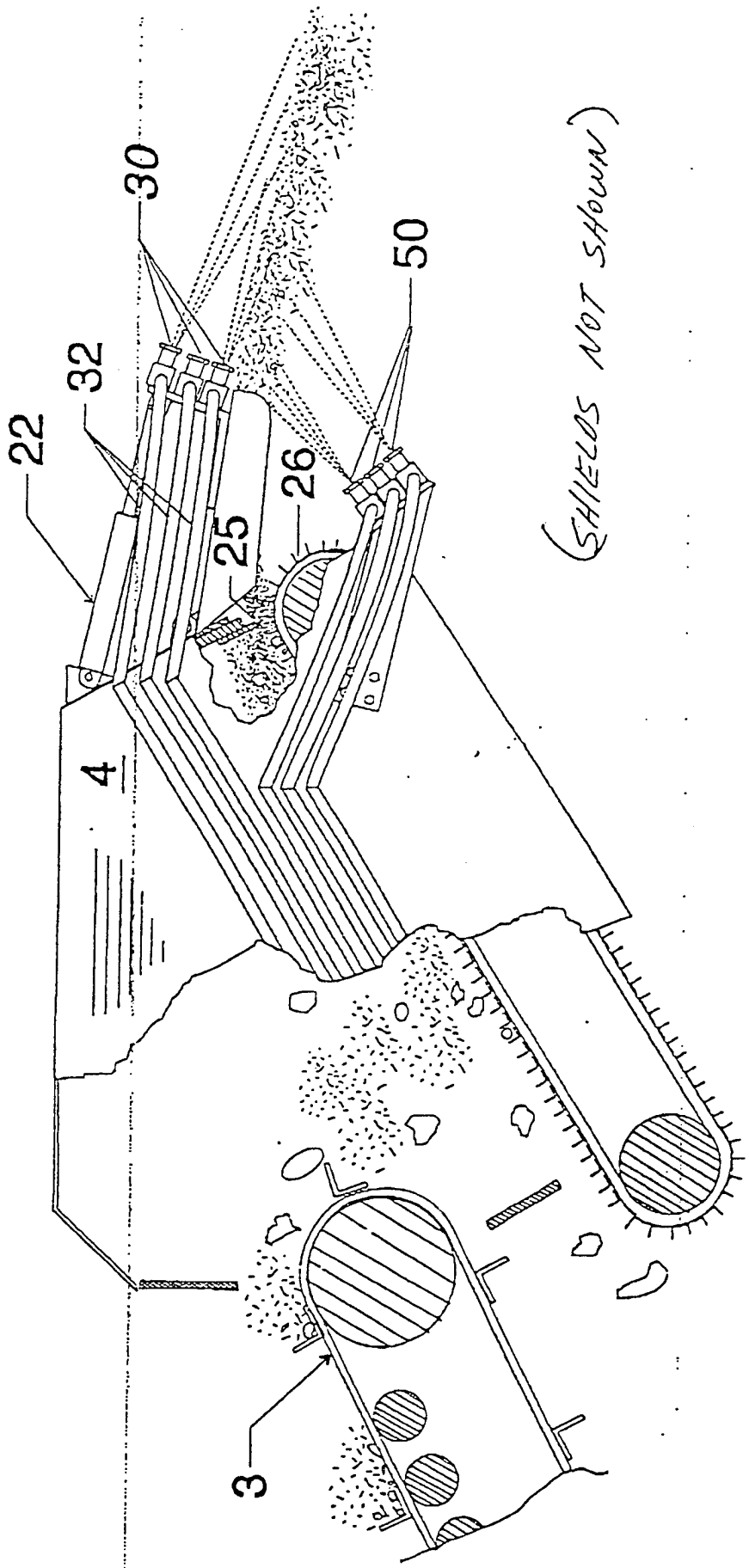


Fig. 8

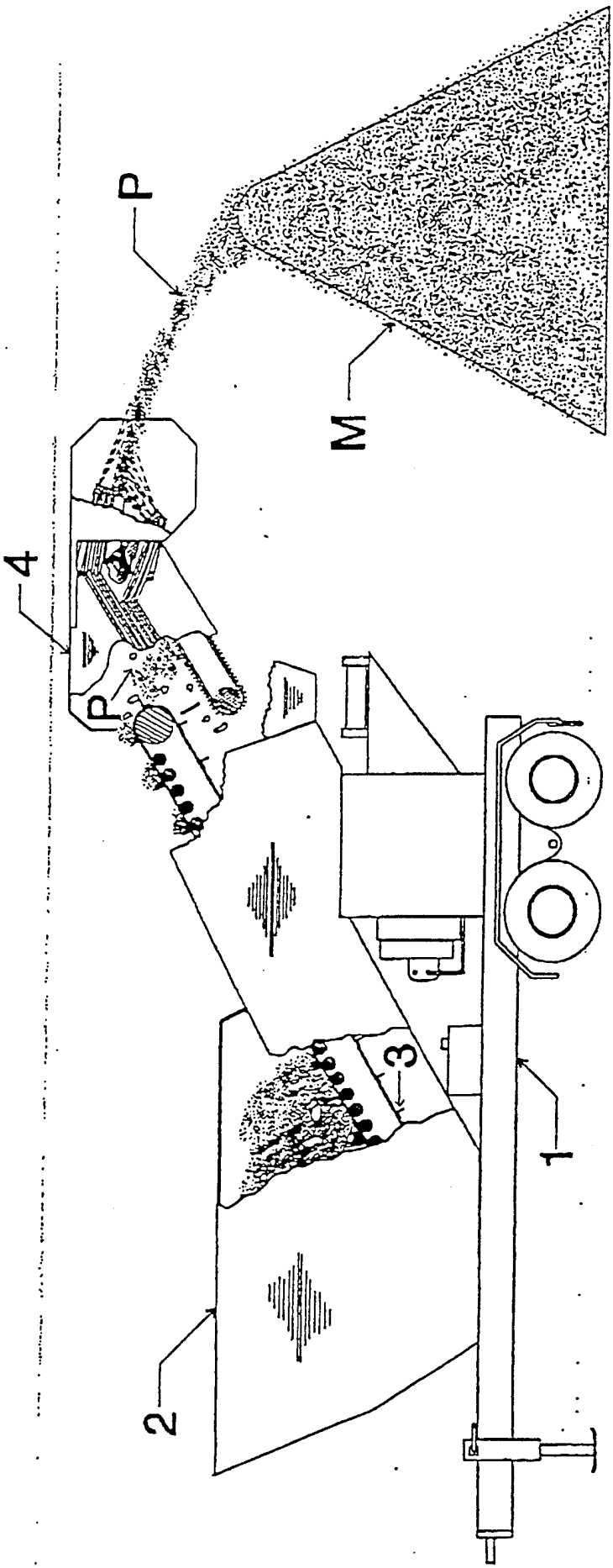


FIG. 7

[redacted] SITE AIR SURVEILLANCE [redacted]
(Honolulu, Hawaii)
OGDEN ENVIRONMENTAL AND ENERGY SERVICES

SITE INFORMATION		Page 3 of 4
PROJECT #:	DATE: 5/1/93	SITE LOCATION:
SITE MANAGER: Jeff Cotter	H&S COORDINATOR: Cathi Seto	KAPALAMA SOUTH

SITE CONDITIONS

SITE PERSONNEL:

TEMPERATURE: 85 F
RELATIVE HUMIDITY:
WIND SPEED & DIRECTION: SW 5-10 mph

SAMPLE No	TIME	SAMPLE DESCRIPTION	LOCATION	INSTRUMENT	READING	COMMENTS
	0918	PERIMETER	15' from Shredder	PID	37.8	NO MIST (sprayer off)
			(downwind)	MR	0.036	
	0923	AREA	1' from Shredded Soil	PID	68.9	NO MIST (sprayer off)
				MR	0.052	
	0927	PERIMETER	15' from Shredded Soil	PID	18.3	w/ MIST (sprayer on)
				MR	0.00	
	0930	AREA	1' from Shredded Soil	PID	42.6	w/ MIST (sprayer on)
				MR	0.00	
	1156	BACKGROUND	Area	PID	0.0	
				MR	0.1	
	1255	PERSONNEL	Breathing Zone	PID	4.2	
				MR	0.1	

PID - Photo Ionization Detector was Photoval Microtiop II
MR - Dust Monitor was MIE MiniRam Dust Monitor

D

DAILY FIELD NOTES

Field Report - Sunday
May 21, 1995

By: Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy
Non-Montgomery Watson Personnel: —
Arrived Site: — Left Site: —
Weather: Clear & sunny, 70's °F
Equipment on Site: —

Field Notes:

Left apartment for Alpena CRTC at 16:30. Truck mileage at 84950. Arrived at Holiday Inn in Alpena at 21:00. Truck mileage at 85200.

Field Report - Monday
May 22, 1995

By: Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy
Non-Montgomery Watson Personnel: Dave Newman (CCC Group), Gary Johnson (CCC Group), Captin Fred Kimble (ANG)
Arrived Site: 0800 Left Site: 1715
Weather: Partly Sunny, low 70's °F, windy
Equipment on Site: JCB 214 backhoe, Komatsu WA180 loader

Field Notes:

8:00-9:00 Met w/ Captin Kimble. Discussed project in general.
9:00-10:00 Captin Kimble and myself met w/ to Dave Newman and Gary Johnson discuss project in general. Met at Fire Training Area.
10:00-10:45 Located work area in warehouse of Building #2. 10:30 called Doug Barber at (810) 344-0205. Gave Doug project update. →

10:45 - 12:30 Met w/ Captn Kimble and Dave Newman. Dave submitted revised Bioremediation System Design, Air Emissions Estimate, and Sampling and Analysis Plan. Discussed Sampling and Analysis Plan. ~~Plan~~ CCC does not have written approval of plan from MDNR. Agreed to contact MDNR project manager (Andy Stempke) and attempt to get his written approval of plan.

Also submitted revised schedule.

12:00 Called Andy Stempke (517) 232-3541 extension 5302. Andy was out of office for the day. Left my name and a brief message.

12:05 Called Carla Lange w/ Eder Associates at (313) 663-2144. Eder is MDNR's review contractor for this site. Carla was out of the office for the day.

12:30 - 13:30 Lunch

13:30 - 15:00 Set up office in warehouse of bldg #2. Updated notebook. My telephone number in bldg. #2 is (517) 354-6498.

15:00 Called Doug Barber (OTB) at (810) 344-0205. Updated progress.

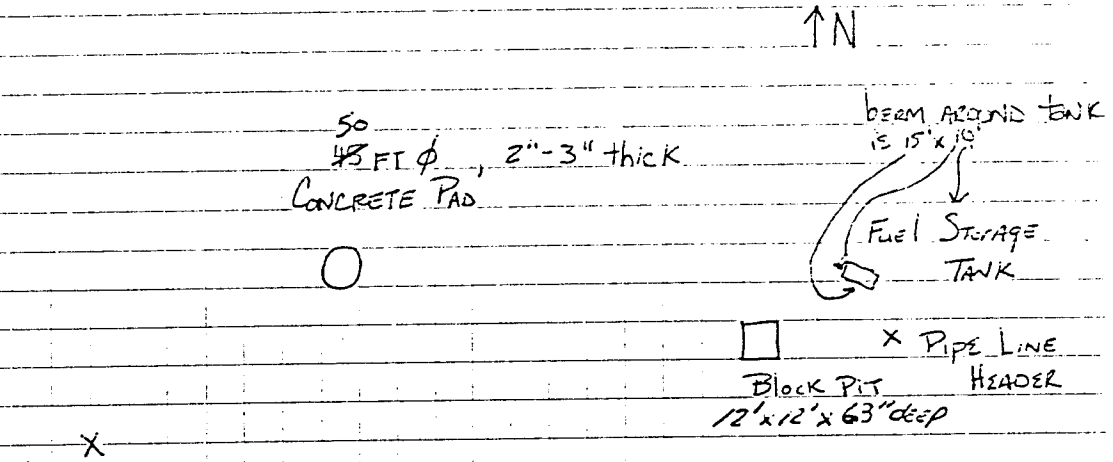
15:00 - 1700 In field overseeing contractor activities. Contractor has set up site trailer on SW ~~#~~ corner of intersection of Hercules and I streets.

Contractor has constructed a diked area using sand and visqueen (plastic) in which he has put his fuel storage tank. Diked area is NE of FTA pad.

Contractor is piling concrete rubble that is near the top of the gulley at Site #4 (Fire Training Area). Contractor has indicated that this concrete →

will be disposed OFF AT A BFI LANDFILL. This is CONSISTENT w/ the requirements OF the CONTRACT.

A rough sketch OF the FIRE TRAINING AREA is provided below:



NW CORNER OF BLOCK PIT TO CENTER OF CONCRETE PAD = ~~136FT~~ 134FT
" " " " " " MW2: ~~80FT~~ (78FT)
" " " " " " MW4: ~~129FT~~ 127 FT

SW CORNER OF BLOCK PIT TO CENTER OF CONCRETE PAD: ~~142FT~~ 140FT
" " " " " " MW2: ~~91FT~~ 69FT
" " " " " " MW4: ~~125FT~~ 123FT

CENTER OF CONCRETE PAD TO MW2: 152FT
" " " " " " MW4: 118FT
" " " " " " MW3: 132FT
" " " " " " PIPE HEADER: 169 FT

MW3 to MW2: 154 FT
" " MW4: 78 FT
" " SW CORNER OF BLOCK PIT: 193FT

MW4 to NW2: 77FT →

NE Corner of Block Pit to Pipe Header = 28 FT
SE " " " " " " " = 26 FT

NE Corner of Block Pit to Fuel Storage Tank = 55 FT
NW " " " " " " " = 58 FT
Pipe Header to Fuel Storage Tank = 60 FT

End of Daily Report 5/22/95

Field Report - Tuesday
May 23, 1995

By: Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy
Non-Montgomery Watson Personnel: Dave Nadman (CCC Group), Gary Johnson (CCC Group)

Arrived Site: 0745 Left Site: 1730
Weather: low 60's °F, periods of rain all day

Equipment on Site: JCB 214 Backhoe,
Komatsu WA180 loader

Field Notes:

0745 - 0945 Review documents. Review MDNR guidance document on Verification of Soil Remediation. Review Unico's revised Sampling & Monitoring Plan dated April 1995.

0945 - 10:15 Project Phone Calls.

Called Carla Lange w/ Eder Associates (313) 663-2144 Carla is putting together letter regarding Unico's Sampling & Monitoring Plan. Carla will fax copy of letter to Cptn. Kimble. →

09:45 - 10:15 (CONTINUED)

CALLED ANDY STEMPKE (512) 232-3541 LEFT VOICE MAIL FOR ANDY STATING THAT I WOULD LIKE TO DISCUSS UNICO'S SAMPLING & MONITORING PLAN.

CALLED DOUG BARBER W/ MONTGOMERY WATSON (810) 344-0205. UPDATED PROGRESS.

10:15 - 12:00

AT SITE #4 (FIRE TRAINING AREA) OVERSEEING CONTRACTOR ACTIVITIES.

CONTRACTOR CONTINUES WORK STOCKPILING CONCRETE. CONTRACTOR IS GATHERING CONCRETE RUBBLE FROM NEAR THE TOP OF THE GULLY (THAT LEADS TO THE SINKHOLE) AND PILING THIS CONCRETE SOUTH OF THE CONCRETE PAD. CONTRACTOR CAN NOT RETRIVE CONCRETE RUBLE FROM WITHIN THE GULLY W/ HIS EXISTING EQUIPMENT.

CONTRACTOR IS DEMOLISHING THE BLOCK PIT. THIS BLOCK PIT WAS USED TO STORE WATER USED DURING FIRE TRAINING EXERCISES.

DROVE BY SITE #2 (DITCH). NO WORK HAS BEEN DONE AT SITE #2. SOME SOIL (ESTIMATED < 10 CYD) HAS BEEN STOCKPILED ON AND COVERED W/ PLASTIC. THIS SOIL WAS REMOVED FROM THE VERY END OF THE DITCH BY A DIFFERENT CONTRACTOR INSTALLING WATER LINE PIPING. THIS SOIL WILL BE TAKEN TO A BIOREMEDIATION TREATMENT CELL AT SITE #4 FOR TREATMENT.

MEASURED

MW2 & PIPELINE HEADER: 95 FT
MW4 TO " " = 157 FT →

10:15 - 12:00 (CONTINUED) CONTRACTOR CONTINUES WORK breaking up concrete pad at FTA. B.11 SLATT (sp?) from BFI shows up on-site and meets w/ contractor. Concrete rubble in and around gully and concrete pad will be disposed at BFI landfill.

CONTRACTOR collects sample of soil from beneath center of concrete pad at a depth of <5FT. This sample has petroleum odor. This sample will be submitted to Micro-Tes for selection of appropriate microorganisms.

12:00 - 13:00 LUNCH.

13:00 - 15:00 Air emissions calculations.

15:00 - 16:00 At Site #4 (FTA) overseeing contractor activities.

CONTRACTOR continuing work on demolishing block pit.

16:00 - 17:30 Volume Calculations.

19:30 - 21:00 Memos to Captin Kimble.

END OF DAILY REPORT 5/23/95.

(5/24/95)

Field Report - Wednesday May 24, 1995

By: Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy
Non-Montgomery Watson Personnel: Dave Newman (CCC Group), Gary Johnson (CCC Group)
Arrived Site: 0750 Left Site: 17:30
Weather: Mostly cloudy, mid 50's °F
Equipment on Job: JCB 214 backhoe, Komatsu WA 180 loader

Field Notes:

08:00 - 0:900 Discussed project w/ Captin Kimble. Discussed Unico's proposed excavation plan at Site #4 and how proposed plan differs from plan in SEAP. Captin Kimble requested that I ask Dave Newman about differences in plans.

Called Doug Barber and updated progress. Faxed Doug calculations I had done on excavation volumes and Air emissions estimate. Doug will have someone backcheck these calculations.

0:900 - 09:30 Notified Dave Newman that I was looking into differences in Unico's excavation plan verses SEAP excavation plan.

At Captin Kimbles request, I called Ms. Jean Micker with Earth Technology Corporation (615) 483-9404. Jean was unavailable. I wanted to ask Jean about the excavation plan outlined in the SEAP.

0:930 - 10:30 In field overseeing contractors activities. Unico is working at Site #4 (FTA) digging a storm water diversion ditch around the fire training area concrete pad. →

10:30 - 11:00 Project Phone Calls.

Called Doug Barber. Doug has not received Carla Lange's comments on Monitoring Plan.

Called Jean McKee. Jean was unavailable.

11:00 - 12:00 In field overseeing Unico activities.

Took photos of Site #4. Unico is continuing work on breaking up the FTA concrete pad at Site #4.

12:00 - 12:15 Spoke w/ Jean McKee from Earth Tech. Explained to Jean that I had several questions on information presented in the SRAP. Specifically, at Site #4 =

1. Why do the Earth Tech drawings show the diameter of the concrete pad as 110 ft? (Actual diameter is 50 ft).
2. Why is the area assumed to be contaminated 165 ft diameter by 20 ft deep.
3. Where were the soil samples referenced in the SRAP collected?

Jean agreed to look into these questions. I agreed to call Jean at 3:30 EST to discuss.

12:15 - 13:15 Lunch

13:15 - 16:15 Review project documents. Unico is setting up site trailer.

16:30 Spoke w/ Carla & Jean McKee of Earth Technology. Jean stated that she had investigated my questions regarding Site #4. Jean →

STATED that EARTH TECH. had developed their feasibility ANALYSIS for SITE #4 USING AN INCORRECT MAP of this AREA. JEAN STATED that the map they used showed the concrete pad at SITE #4 to be 110FT IN diameter. (The ACTUAL diameter OF the PAD IS 50 FT.) Consequently, EARTH TECH. developed AN INCORRECT estimate of the volume of soil to be REMEDIATED.

JEAN STATED that the soil SAMPLES collected IN the SKAP were collected at the edge of the concrete PAD.

JEAN could NOT give AN estimate OF the soil to be remediated. She could only SAY that remediation should include all soil beneath the CONCRETE PAD.

~~16:45 - 12:1+~~

15:45 - 16:15 MET W/ CAPTN Kimble AND DAVE NIWMAN. Discussed impact that wrong volume estimate by EARTH TECH may have ON our project. IT WAS decided that UNICO would proceed W/ excavation at SITE #4 according to their plan outlined IN their May 1995 submittal. IT WAS RECOGNIZED that this MAY result IN excavation & treatment of significantly less soil than predicated by EARTH TECH. IF this does happen, the ANG may seek a deduct from UNICO ~~from~~ for the reduction IN work.

A/so discussed requirement for Unico to keep project NOTEbook. Dave stated that he is doing so.

16:45 Received call from Doug Barbee. Updated D-9 ON PROJECT.

END OF Daily Report 5/24/95

DURING AFTERNOON Stockpiled concrete from NEAR the top of the gully at SITE #4 WAS trucked from the site for disposal at the GFI Hills PARK LANDFILL IN ONAWAY, MI. →

Field Report - Thursday May 25, 1995

By: Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy,
Non-Montgomery Watson Personnel: Dave Newman, Gary Johnson
Arrived at Site: 02:50 Left Site ~~17:00~~ 17:30

Weather: Partly sunny, 60's °F

Equipment on Site: JCB 214 backhoe, Komatsu WA90 loader

Field Notes:

0:800 - 8.45 Overseeing Unico activities at Site #4 (FTA). Unico is continuing work on breaking up concrete pad. It should be noted that none of the concrete that was hauled off site yesterday came from the concrete pad. A sample of the concrete pad has been given to BFI for proper disposal classification.

08:45 Called Tom Barczyk w/ Montgomery Watson (810) 344-0205. Tom was unavailable.

Called Andy Stempke w/ MDNR (517) 332-3541. Andy was out of the office today. Andy is expected to return tommorrow.

0:900 - 11:00 At Site #4 overseeing contracter activities.

Unico completes breaking up concrete pad. Continues work breaking up block pit.

(5/25/95)

11:00 – 11:30 Discussed Eder Associates comments on Unico monitoring plan w/ Captin Kimble and Dave Newman. Captin Kimble requested that I contact MDNR and try to arrange a meeting to discuss monitoring plan.

11:45 Called MDNR at (517) 732-3541. Spoke w/ John Alford (sp?). John is Andy Stenpke's boss. Explained that I would like to arrange a meeting to discuss monitoring plan. John stated that he thoughout either hisself or Andy would be available to meet next Thursday. John stated that someone would call Captin Kimble tommorow to confirm.

12:00 – 13:00 Lunch.

13:00 – 15:00 Air emissions estimate. Submittal review.

15:00 – 17:00 At Site #4 overseeing Unico activities. Unico has completed demolition of block pit. The fuel pipeline from the header to the concrete pad was visable just off the NE corner of the block pit at approx. 3 to 5 ft below grade. Unico has erected caution tape around block pit excavation.

End of Daily Report 5/25/95

12
(5/26/95)

Field Report - Friday
May 26, 1995

By: Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy
Non-Montgomery Watson Personnel:
Dave Newman (Unico/CCC Group)
Gary Johnson (CCC Group)
Arrived Site: 0750 Left Site: 14:00

Weather Clear & Sunny, 90's °F

Equipment on Job: JCB 214 backhoe,
Komatsu WA180 Loader

Field Notes:

0:800 - 08:30 Update Captin Kimble on progress.

08:30 - 09:15 At Site #4. Unico has erected snow fencing around concrete pad. Unico is working on lining up trucks to haul of the remainder of the concrete rubble. Plastic for construction of bio cells has arrived. I believe the plastic is 30 mils.

Called Doug Barber and updated progress.

9:15 - 10:30 Memo on excavation volumes.

10:30 - 11:30 Overseeing Unico activities at Site #4. Unico is unrolling plastic liner that will be used to construct bio cell. This cell is located North of concrete pad.

12:00 - 13:00 Lunch

(5/26/19)

13:00 - 13:30 At Site #4 observing Unico's activites. Unico has constructed a berm around bio cell and is putting SAND on liner.

13:30 Updated Captain Kimble on project progress. Captain Kimble requests that I verify Unico is not using base SAND to construct drainage layer on bio cell.

Spoke w/ Dave Newman. Dave assured me that Unico was only using enough SAND to hold their liner down over the weekend. Unico's sand will arrive on Wednesday

Dave stated that Unico is almost done for the day.

15:30 - 14:00 Demob. ize. Leave for office, truck mileage at = 85426.

18:30 - 19:00 Arrive at office. Mileage at: 85658. Demob. ize.

— End of Daily Report —

(5/31/95)

Field Report - Wednesday May 31, 1995

By: Ben McGeachy

~~Non~~ Montgomery Watson Personnel: Ben McGeachy

Non-Montgomery Watson Personnel:
Dave Newman (Unice/CCC Group)
Gary Johnson (CCC Group)

Arrived Site: 1300 Left Site: 1700

Weather: Clear, sunny, 80's °F

Equipment on Job: Komatsu PC300 LC tracked backhoe, Komatsu WA180 rubber tire loader

Field Notes:

07:15 - CE 00 Mobilize at office. My truck out of office at 85750

8:00 - 12:30 Travel to Alpena. Arrive at Hotel. My truck at 86000.

13:00 - 14:00 Meet w/ Dave Newman and Captin Kimble. Captain Kimble informs us that:
1) We have a meeting w/ MDNR staff tomorrow to discuss monitoring plan; and
2) Contracting officer, Dawn Dass, w/ USAFO is investigating differences in volumes at Site #4.

14:00 - 15:00 Meet w/ Captin Kimble. Discuss memo on volumes at Site #4 and air emissions estimate. Call Doug Barber in Detroit w/ changes to volume memo. Doug will revise and fax to Cptn. Kimble.

15:00 - 17:00 At Site #4 overseeing Unico's activities.

Unico is using large tracked backhoe to remove debris from gully to sinkhole.

Concrete from concrete pad has been removed.

Unico has received & placed some sand for the drainage layer of biocell #1 (constructed on 5/26/95) Unico, at Captn Kimble's request, has placed some drill cuttings (<10cy) fr, leftover from previous investigations, on biocell #1 for treatment.

Unico has received ~80 55-gallon plastic drums labeled:

Micro-Tes Inc.
12500 Network, Suite 201
San Antonio, Texas 78249
(210) 558-4751

LFS-1™
Live Mixture of Hydrocarbon Metabolizing Bacteria

Unico has received ~80 5-gal plastic buckets labled:

Micro-Tes Inc.
12500 Network, Suite 201
San Antonio, Texas 78249
(210) 558-4751

Bacterial Nutrient

15:00 - 17:00 (CONTINUED) CONTRACTOR RECEIVES ANOTHER LOAD OF SAND (to be used as A DRAINAGE layer IN biocells).

UNICO IS ALSO CONTINUING WORK stockpiling CONSTRUCTION debris collected from AROUND the gully.

— END OF DAILY REPORT —

FIELD REPORT - THURSDAY
JUNE 1, 1995

By: BEN McGEACHY
MONTGOMERY WATSON PERSONNEL: BEN McGEACHY
NON - MONTGOMERY WATSON PERSONNEL:
DAVE NEWMAN (UNICO / CCC GROUP)
GARY JOHNSON (CCC GROUP)
ARRIVED SITE: 07:30 LEFT SITE: 17:00
WEATHER: CLOUDY, UPPER 70's F
EQUIPMENT ON JOB: KOMATSU PC300LC TRACKED BACKHOE,
KOMATSU WA180 RUBBER TIRE LOADER

FIELD NOTES:

0:800 - 10:00 AT SITE #4 overseeing UNICO ACTIVITIES.

UNICO CONTINUES to WORK ON REMOVING CONSTRUCTION debris FROM gully.

10:00 - 11:30 FINALIZE MEMORANDUM ON REMOVAL VOLUMES.

11:30 - 12:00 LUNCH

12:00 - 15:30 MEETING AT MDNR GAYLORD OFFICE.
ATTENDEES = CAPTAIN KIMBLE, DAVE NEWMAN, BEN McGEACHY, JOHN ALFORD (MDNR), AND ANDY STEMPKE (MDNR). →

12:00 - 16:30 (CONTINUED) Meeting centered on Unico's proposed Monitoring Plan.

16:30 - 17:00 Called Bryan Hughes w/ Montgomery Watson - Detroit. Bryan stated that we do not yet have a copy of new environmental clean up standards (MI. Act 451?); however, Bryan hoped to get a copy early next week.

— End of Daily Report —

Field Report - Friday
June 2, 1995

By: Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy
Non-Montgomery Watson Personnel:
Dave Newman (Unico/CCC Group)
Gary Johnson (CCC Group)
Arrived Site: 07:50 Left Site: 16:30
Weather: Cloudy, humid, 70's °F - 80's °F
Equipment on Job: Komatsu PC300LC tracked backhoe,
Komatsu WA180 rubber tire loader

Field Notes:

0:800 - 11:30 Working on minutes for meeting w/ MDNR on 6/1/95. Distributed draft copy of minutes to Captain Kimble and Dave Newman for review. Dave Newman & Gary Johnson gone all morning getting supplies.

11:30 - 12:00 Made copy of weekly notes for Captain Kimble.

12:00 - 13:00 Lunch.

13:00 - 13:30 Review project document.

13:30 - 14:30 Review Unico's Air Emissions Estimate w/ Dave Newman (done at Captain Kimbles Request).

14:30 - 16:00 At Site #2 overseeing Unico's activities.

Unico is preparing the ditch at Site #2 for in-situ bioremediation. Unico is using the Komatsu backhoe to scrap up the top 1ft of soil. The scraping action is similar to tilling a garden where the top layer (grass, weeds, tree roots, etc.) is over turned and mixed in with the soil beneath it.

Dave Newman explained that once the area has been prepared, a mixture of bacteria, bacterial nutrient, and water will be sprayed on to the soil.

Dave explained that the mixture has the following recipe:

See Notes dated 5/31/95. → 1 55-gal drum bacteria
→ 1 5-gal bucket bacteria nutrient
50 gals water

Unico has made up some volume of this mixture that they are storing in a green (teal), plastic tank. Plastic tanks looks to be ~~250~~ 500 gallon tank.
1,000

This work is being done at the ~~South~~ East end of the ditch near the intersection of First Ave and R/G Rd. →

16 00 - 17 30 Meet w/ Captain Kimble and Dave Newman to discuss project progress. Discuss work completed to date and future work. Traveled to both Sites #2 and #4 to inspect progress.

17 30 - 18 30 Discuss project w/ Captain Kimble

— End of Daily Report —

Field Report - Monday
June 5, 1995

By: Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy
Non-Montgomery Watson Personnel:
Dave Newman (Unico/CCC Group)
Gary Johnson (CCC Group)
Arrived Site: 07 55 Left Site: 16:30
Weather: Mostly sunny, 80's °F
Equipment on Job: Komatsu PC300LC tracked backhoe,
Komatsu WA180 loader

Field Notes:

* Captain Kimble is out of his office all week. Captain Kimble is attending OSHA 40-hr training at the Michigan State Police facility in Lansing, MI.

8:00 - 8:30 Discuss project w/ Dave Newman and Gary Johnson. Dave stated that he was unsure when Rover Shredder would arrive at site. Shredder is currently working on job in Indiana. Dave stated that Unico would focus efforts on Site #2 until the shredder arrives.

8:30 - 9:00 Reviewed CONTRACT documents. At Cptn. Kimble's request, I searched CONTRACT documents for disposal requirements for trees taken down at Site #2. I was unable to find specific language addressing tree disposal. In general, Unico is required to restore the site to original condition.

9:00 - 9:30 Called Bryan Hughes w/ Montgomery Watson in Detroit to see if we had received new clean up levels under Act 451. Bryan stated that MDNR has not released revised clean up levels but hoped to do so this week.

9:30 - 10:30 Overseeing Unico's activities at Site #1. Unico is finishing putting clean sand drainage layer on bio-cell #1.

10:30 - 11:45 Overseeing Unico's activities at Site # 2. At Cptn. Kimble's request, I spoke w/ Dave Newman of Unico regarding trees removed from ditch at Site #2. Explained that Cptn. Kimble believed Unico may be required to chip trees, however, I was unable to find anything in contract documents regarding tree disposal. I told Dave that I would get direction from Captain Kimble when I am able to reach him.

Unico collects soil samples from drainage ditch for analysis of SVOC's and lead. Analytical results will be compared to Act 451 clean up levels.

Sample I.D.	Sample STA. 1	Submitted for Analysis of
SZ-01-DD-00	0	SVOC, LEAD
SZ-01-00-dup		
SZ-01-DD-25	25	SVOC
SZ-01-DD-50	50	SVOC, LEAD
SZ-01-DD-75	75	SVOC
SZ-01-DD-100	100	SVOC, LEAD
SZ-01-DD-125	125	SVOC
SZ-01-DD-150	150	SVOC, LEAD
SZ-01-DD-200	200	LEAD
SZ-01-DD-250	250	LEAD
SZ-01-DD-300	300	LEAD
SZ-01-DD-350	350	LEAD
SZ-01-DD-400	400	LEAD

NOTES:

1. Sample station lists Number of ft from end of culvert pipe NEAR FIRST AVENUE (i.e, STA. 0 is at point of discharge from culvert pipe into ditch, STA 25 is 25 ft downstream from point of discharge, etc.).
2. SAMPLE ID breaks down as follows:

SZ - 01 - DD - 100

- SZ: Site #2
- 01: Sample Event #1
- DD: Drainage ~~Ditch~~ Ditch
- 100: 100 ft from pt. of discharge.

3. All soil samples ~~out~~ were collected from surface soil. The 1st 150 ft of the ditch was excavated to a depth of 1 ft on 6/5/95. The soil was mixed. Samples collected from surface on 6/5/95 should be representative of 1st foot (depth).

6/5/95

10:30 - 11:45 (CONTINUED) UNICO is clearing remainder of drainage ditch at Site #2 (i.e., from 150 ft to 400 ft)

12:00 - 13:00 LUNCH

13:00 - 14:00 FINALIZE MEETING MINUTES from MEETING W/ MDNR on 6/1/95. FAXED to Paul Wheeler (ANG) AND Andy Stempke & John Alford (MDNR). Dropped copy on Cptn Kimbles desk AND GAVE copy to DAVE NEWMAN.

14:00 - 16:00 AT SITE #2 OVERSEEING UNICO ACTIVITIES. UNICO completes CLEARING ditch to fence line. UNICO uses ~~hay~~ STRAW bales at end of ditch as EROSION control.

16:00 - 16:30 Review project documents.

— END of Daily Report —

(6/6/95)

Field Report - Tuesday
June 6, 1995

By: Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy
Non-Montgomery Watson Personnel:
Dave Newman (Unico/CCC Group)
Gary Johnson (CCC Group)
Arrived Site: 07:55 Left Site: 12:10
Weather: Mostly sunny, 80's °F
Equipment on Site: Komatsu PC300LC tracked backhoe,
Komatsu WA130 rubber tire backhoe

Field Notes:

08:00 - 08:30 Met w/ Dave Newman of Unico to determine Unico schedule. Dave stated that Unico will be excavating and stockpiling soil from beneath concrete pad at Site #4, today. Unico is waiting for Loyer Shredder to arrive. Unico expects shredder to arrive this Friday or sometime this weekend.

08:30 - 09:30 Written comments to Unico submittals.

09:30 Call OSHA 40 hr training program and leave a message for Captain Kimble to call me. Telephone Numbers to OSHA training program are (517) 322-1190 or (517) 322-1942.

09:30 - 12:45 Reviewed revised clean up levels under Michigan Act 451. Worked on Memorandum summarizing findings

12:45 - 13:45 Lunch.

13:45 - 14:30 At Captain Kimble's request I spoke w/ Dave Matash (A.N.G.) concerning trees removed from drainage ditch and stockpiled at Site #2. Dave and I inspected stockpiled trees. Dave stated that he would have trees taken care of (either chopped up for firewood or put through a chipper).

14:30 - 15:00 Discuss memorandum on revised clean up levels w/ Doug Barber of Montgomery Watson.

15:00 Inspect Unico activities at Site #4. Unico has begun to excavate the soil from beneath the concrete pad. Unico is stockpiling the soil on plastic near biocell #1. It appears that the concrete pad was constructed over a layer of asphalt. The asphalt layer sits ~ 3 to 4 ft beneath the concrete pad.

15:30 - 17:00 Finalize memo on revised clean up standards pursuant to Mich. Act 451. Fax memo to Fred Kimble and Paul Wheeler.

— End of Daily Report —

(6/7/95)

FIELD REPORT - WEDNESDAY
JUNE 7, 1995

By: BEN McGEACHY
MONTGOMERY WATSON PERSONNEL: BEN McGEACHY
NON-MONTGOMERY WATSON PERSONNEL:
DAVE NEWMAN (UNICO / CCC GROUP)
GARY JOHNSON (CCC GROUP)
ARRIVED SITE: 07:55 LEFT SITE: 17:00
WEATHER: HOT & MUGGY IN A.M - 70's °F, cool/cloudy/windy in P.M - 50's F
EQUIPMENT ON JOB: KOMATSU PC300LC TRACKED BACKHOE
KOMATSU WA 180 LOADER

FIELD NOTES

8:00 - 8:30 MET W/ DAVE NEWMAN. DAVE WILL TRY TO REACH HIS CREW THAT WILL BE BRINGING THE ROGER SHREDDER TO THE SITE. IF THE SHREDDER IS AVAILABLE, DAVE WOULD LIKE TO WORK THIS WEEKEND.

8:30 - 9:00 CALLED DOUG BARBER W/ MONTGOMERY WATSON AND UPDATED PROJECT PROGRESS. FAXED DOUG A COPY OF MEMO ON REVISED CLEAN UP LEVELS. DOUG STATED THAT HE WILL BE CALLING PAUL WHEELER (ANG) TO DISCUSS REVISED CLEAN UP LEVELS.

9:00 - 9:45 OVERSEEING UNICO ACTIVITIES AT SITE 4. UNICO IS MOVING SOIL EXCAVATED FROM BENEATH THE CONCRETE PAD TO A STOCKPILE NEAR BIOCELL #1. STOCKPILE IS ON VISQUEEN.

10:00 - 12:00 REVIEW / SUMMARIZE WORK COMPLETED FOR MONTHLY STATUS REPORT FOR MAY 1995.

12:00 - 13:00 LUNCH

13:00 - 13:15 CHECKED ON UNICO ACTIVITIES; UNICO STILL WORKING ON STOCKPILING SOIL AT SITE #4.

13:20 Captain Kimble calls to discuss project Update, Captain Kimble on progress. Specifically, we discussed:

- Unico continuing work at Site #4 stockpiling soil.
- Captain Kimble received fax on revised clean up standards under MI Act 451. D. Captain Kimble does not think that contract allows him to change scope of contractor's work.
- Unico would like some help getting Walton (water line contractor) to replace culvert pipe they broke at Site 2. Captain Kimble instructs me to see Bill Delorme.
- Dave Matash said that he would take care of dead trees that are stockpiled at Site 2.
- Unico expects paper shredder to arrive on Saturday and be operational on Monday (6/12/95).
- Montgomery Watson personnel will not be on-site on Friday 6/9/95 but will return on Monday 6/12/95.
- Unico would like to replace ECP scheduled to be installed at Site 2 w/ plastic pipe. Captain Kimble stated that he would like to stick w/ reinforced concrete pipe.

13:45 - 16:45 Observing Unico's activities at Site 4. Unico continues to stockpile soil near biocell #1. After closer examination I realize that the soil what I thought yesterday was a layer of asphalt beneath the concrete pad is just a layer of organic material (i.e black soil).

— End of Daily Report —

FIELD REPORT - THURSDAY
JUNE 8, 1995

By: Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy
Non Montgomery Watson Personnel:

Arrived at Site: 0755 Left Site: 1600

Weather: Mostly cloudy & cool in AM, sunny & windy in P.M. 60's °F
Equipment on Job: Komatsu PC300LC tracked backhoe, Komatsu WA420 rubber tire loader, Komatsu WA150 rubber tire loader
Field Notes:

8.00 Dcone by Site 2. Walsh (water main contractor) has replaced the section of culvert that they broke when installing the water line. Walsh replaced the broken section w/ 18 inch diameter, green, PVC pipe.

8.00 - 9:30 Observing Unico's activities at Site 4, Unico continues excavating soil from beneath the concrete pad and transporting to a stockpile near biocell #1.

9:30 Spoke w/ Doug Barber of Montgomery Watson - Detroit. Doug stated that he had spoken w/ Paul Wheeler with the Air National Guard ~~and that~~ regarding revised clean up levels. Paul understands that there may not be a need to remediate Sites) 2 and/or 4 but would like to continue w/ the project anyway.

9:30 - 11:30 Observing Unico's activities at Site 4. Digging soil from beneath concrete pad & stockpiling.

11:30 At Captain Kimble request, faxed Contract Progress Report to Eva Lauchie w/ USPFO in Lansing, MI.

12:00 - 12:45 Lunch

12:45-14:45 Observing Unico's activities at Site #4. Unico continues to excavate & stockpile soil. Estimate the size of excavation as cylinder 50FT in diameter and 20FT deep.

14:45 Depart by Site 2. Stockpiled trees had been removed / disposed by base personnel.

15:00 Called Eva Louchie w/ USFFC in Lansing, MI. Eva was out but spoke w/ Beth. Confirmed that earlier fax got through to Eva.

— End of Daily Report —

(6/12/95)

Field Report - Monday
June 12, 1995

By: Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy
Non Montgomery Watson Personnel:
Dave Newman (Unico / CCC Group)
Gary Johnson (CCC Group)
Dave Evans (CCC Group)
Mike Potter (CCC Group)
Arrived at Site: 07:45 Left Site: 17:00
Weather: Sunny, 70's - 80's °F
Equipment on Job: Komatsu PC300LC tracked backhoe,
Komatsu WA420 rubber tire loader,
Komatsu WA480 Rubber tire loader,
Royer Shredder

Field Notes:

8:00 - 9:30 Observing Unico's activities at Site #4. Unico is removing snow fencing from around excavation of concrete pad.

Unico is still waiting on delivery of Royer Shredder. Shredder was expected to be here but it is not here. Dave Newman was trying to track down the location of the shredder.

9:30 - 10:30 Update Captain Kimble on project progress. Captain Kimbles states that he intends to discuss revised cleanup levels w/ Paul Wheeler (ANG) tomorrow.

10:30 - 11:30 Observing Unico's activities at Site 4. Unico is making preparations for arrival of shredder.

12:00 - 13:00 Lunch

13:00 - 15:00 Reviewed MDNR guidance memorandums on revised clean-up levels under House Bill 4576. Left copy of memorandums for Captain Kimble.

15:00 - 17:00 Observing Unico's activities at Site 4. Hoyer shredder has arrived. Shredder is being set up near biocell 1. Unico will feed stockpiled soil into shredder.

Unico begins feeding soil into shredder. First few loads of soil will be used to adjust feed rates to site conditions.

In general the process goes as follows:

1. Mix up bacteria with nutrients and fresh water. Bacteria and, nutrients, and fresh water are pumped from 55-gallon drums into a 500-gallon plastic tank on the back of a flat bed trailer (towed by a pick up truck). The liquids are pumped using a Racer Pump, model # 5EB2PL E3C (code # 82374N) with a gas powered 3.5 Hp Briggs & Stratton engine. The liquids are mixed in the following ratio:
   - 1 drum (55 gal) of bacteria,
   - 1 5-gal bucket of nutrients,
   - 50 gallons of water.

   Unico intends to make up mixture in 250 gallon increments because once bacteria is exposed to air it should be sprayed on soil within 4 hrs.

2. Once the mixture is made, the pick up tows the 500-gal tank over to the shredder. The pickup and tank sit outside the biocell but the shredder sits inside the biocell. Hoses are used to connect the 500-gal tank to the

shredder. A pump on the shredder sucks the mixture from the 500-gal tank and sprays mixture onto soil. The application rate will be approximately 1 gallon of mixture to 1 cy of contaminated soil.

3. Contaminated soil is feed into the shredder by the rubber tire loaders. The Komatsu WA420 has a 4cy bucket and the Komatsu WA180 has a 2.5 cy bucket. Unico hopes to average 100 cy of soil per hour through the shredder. Contaminated soil goes through the shredder (which kicks out large items such as rocks) and is sprayed as it exits the shredder with the mixture.

— End of Daily Report —

(6/13/95)

Field Report - Tuesday
June 13, 1995

By Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy
Non-Montgomery Watson Personnel:
Dave Newman (Unico/CCC Group)
Gary Johnson (CCC Group)
Dave Evans (CCC Group)
Mike Fetter (CCC Group)
Arrived Site: 07:45 Left Site: 17:00
Weather: Sunny, high 70's - low 80's °F
Equipment on Job: Komatsu Pc300LC tracked backhoe, Komatsu WA420 rubber tire loader, Komatsu WA180 rubber tire loader, Layer Shredder

Field Notes

08:00 - 10:00 At Site 4 observing Unico's activities. Unico is feeding stockpiled soil through shredder. Shredder is discharging to west end of biocell 1.

10:00 - 11:00 Working on verifying Earth Technologies maps for other sites at base

11:00 - 12:00 Observing Unico's activities at Site 4. Unico is processing stockpiled soil through shredder. Dave Newman estimate processing rate at 100 - 150 CY per hour and the moisture of the discharged soil at 12 - 14%.

12:00 - 13:00 Lunch

13:00 - 14:00 Walking Sites 1, 3, & 9 trying to verify Earth Technology's maps.

14:00 - 15:00 Review MONR memo's on revised clean up levels.

15:00 - 16:00 Observe Unico's activities at Site 4. Unico should complete 1 full window of soil by end of day.

16:00 - 17:00 Worked on memo on revised cleanup standards.

1930 Spoke w/ Mike Kapola (Sp?) at (517) 356-6666. Mike is an Administrator for Maple Ridge Township. The Alpena CRTC is located in Maple Ridge Township. Mike stated that most of the CRTC property is currently zoned as "Farm & Forest" w/ some of the property located down by the river zoned as "Conservation & Resources". Mike stated that the Maple Ridge Twnshp. Comprehensive Plan designates this area as Industrial. This does not mean that the land will be zoned industrial but that it may be zoned industrial

— End of Daily Report —

Field Report - Wednesday June 14, 1995

By: Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy
Non-Montgomery Watson Personnel:
Dave Newman (Unico/CCC Group)
Gary Johnson (CCC Group)
Dave Evans (CCC Group)
Mike Potter (CCC Group)
Arrived Site: 07:45 Left Site: 1900
Weather: Windy, 70's °F
Equipment on Site: Komatsu PC300LC Hracked backhoe,
Komatsu WA470 rubber tire loader,
Komatsu WA180 rubber tire loader,
Royer Shredder.

Field Notes:

8:00-9:00 Working on memo. on revised clean up criteria.

(6/14/95)

9:00 - 11:00 Observing Unico's activities at Site 4. Unico is working on 2nd windrow of soil in biocell 1. The 2nd windrow, similar to the 1st, is being constructed from west to east. Biocell 2 is roughly 50ft (N-S) by 200ft (E-W). Biocell 1 is made from 30mil HDPE liner and has a drainage sump at the west end. The 1st windrow of soil in biocell 2 has 15 cone shaped piles adjacent to each other. Each pile is roughly 10-12 ft high.

Unico is using a dump truck to shuttle excavated soil from the FTA to a stockpile near biocell 2. This is NOT working well as the dump truck keeps getting stuck.

Unico does get rid of dump truck. Unico is considering moving shredder next to excavation, then shuttling shredder soil over to biocells. Right now the limiting factor is how fast Unico can get the ~~bags~~ soil to the shredder.

11:00 - 12:00 Work on memo on released clean up levels

12:00 - 13:00 Lunch.

13:00 - 17:00 Observing Unico's activities at Site 4. Unico is still working on feeding stockpiled soil through shredder.

14:00 - 15:00 Review contract documents.

15:00 - 16:30 Observing Unico's activities at Site 4. Unico working on feeding stockpile through shredder. Unico has traded in the Komatsu WA180 loader for a Komatsu WA380 loader. Unico has completed 2nd windrow of soil in biocell 1. Biocell is now full (~1,000 - 1,500 cy).

— END OF DAILY REPORT —

FIELD REPORT - THURSDAY
JUNE 15, 1995

By: BEN MCGEACHY
MONTGOMERY WATSON PERSONNEL: BEN MCGEACHY
NON MONTGOMERY WATSON PERSONNEL:
DAVE NEWMAN (CCC GROUP)
GARY JOHNSON (CCC GROUP)
DAVE EVANS (CCC GROUP)
MIKE ~~PETERSON~~ POTTER (CCC GROUP)
ARRIVED SITE: 07:45 LEFT SITE: 17:00
WEATHER: SUNNY, HOT, 80'S °F
EQUIPMENT ON JOB: KOMATSU PC300LC TRACKED BACKHOE,
KOMATSU WA420 RUBBER TIRE LOADER,
KOMATSU WA320 RUBBER TIRE LOADER,
ROYER SHREDDER

8:00 - 8:45 MET W/ CAPTAIN KIMBLE & UPDATED PROGRESS. CAPTAIN KIMBLE STATED THAT HE MET W/ PAUL WHEELER (ANGRC/CERV) ON 6/14/95 AND THEY DISCUSSED REVISED CLEAN UP CRITERIA. CAPTAIN KIMBLE STATED THAT HE & PAUL AGREED TO MOVE FORWARD W/ THE PROJECT WITHOUT ANY CHANGES TO SCOPE OF WORK.

8:45 - 9:45 FINALIZE MEMO ON REVISED CLEAN UP LEVELS. GAVE COPY TO CAPTAIN KIMBLE, FAXED COPY TO PAUL WHEELER.

9:45 - 11:45 OBSERVING UNICO'S ACTIVITIES AT SITE 4. UNICO HAS FINISHED FILLING BIOCELL 1 AND IS NOW CONSTRUCTING BIOCELL 2. BIOCELL 2 IS BEING BUILT ADJACENT TO BIOCELL 1 ON THE SOUTH SIDE. THE SOUTH WALL OF BIOCELL 1 IS THE NORTH WALL OF BIOCELL 2. CONSTRUCTION OF BIOCELL 2 IS THE SAME AS CONSTRUCTION OF BIOCELL 1 (I.E., DRAINAGE LAYER, SUMP, ETC..).

UNICO IS TRYING A DIFFERENT APPROACH W/ BIOCELL 2. RATHER THAN HAVE THE ROYER SHREDDER IN THE BIOCELL AND MOVING AS NECESSARY, UNICO HAS MOVED THE ROYER SHREDDER OVER TO THE STOCKPILE OF CONTAMINATED SOIL. THE TRACKED BACKHOE IS BEING USED TO FEED THE SHREDDER. THE 2 LOADERS ARE BEING USED TO

carry the shredded/~~mixed~~ inoculated soil over onto biocell 2. The loaders are dumping the soil onto the biocell in windrows similar to those produced by the shredder.

12-13:00 Lunch

13:00-15:00 Observe Unico's activities at Site 4. Unico feeding soil through shredder.

15-16:30 Meet w/ Captain Kimble and Dave Newman. Discuss project progress and schedule. Dave states that he expects to stabilize soil at Site 2 within next 2 weeks. Discuss revised clean up levels. Captain Kimble instructs Dave to proceed w/ the project as though the revised levels did not exist (i.e., no changes to project).

— End of Daily Report —

FIELD REPORT - FRIDAY
JUNE 16, 1995

By: BEN McGEACHY
Montgomery Watson Personnel: BEN McGEACHY
Non Montgomery Watson Personnel:
DAVE NEUMAN (Unico/CCC Group)
GARY JOHNSON (CCC Group)
DAVE EVANS (CCC Group)
MIKE POTTER (CCC Group)
ARRIVED SITE: 0745 LEFT SITE: 1645
WEATHER: SUNNY, 80's °F
EQUIPMENT ON JOB: Royer Shredder,
KOMATSU PC300LC TRACKED BACKHOE,
KOMATSU WA420 RUBBER TIRE LOADER,
KOMATSU WA320 RUBBER TIRE LOADER,

FIELD NOTES:

8:00 - 10:00 REVIEW CONTRACT DOCUMENTS.
SPOKE W DAVE LINSEY OF MDNR ERD GAYLORD DISTRICT OFFICE CONCERNING COMMERCIAL/INDUSTRIAL SOIL CRITERIA DEEMED PROTECTIVE OF GROUNDWATER.

10 - 12:00 AT SITE 4 OBSERVING UNICOS ACTIVITIES. UNICO IS FEEDING SOIL FROM THE STOCKPILE THROUGH THE SHREDDER. THE SHREDDER IS LOCATED DIRECTLY ADJACENT TO THE STOCKPILE. SHREDDED SOIL IS TRANSPORTED BY LOADER TO THE BIOCELL (BIOCELL 2). UNICO IS NOT EXCAVATING SOIL FROM SITE 4. UNICO'S PLAN IS TO RUN ALL THE STOCKPILED SOIL THROUGH THE SHREDDER, THEN MOVE THE SHEEDDER TO DIRECTLY ADJACENT TO THE EXCAVATION. THE LOADERS WILL SHUTTLE SHREDDED SOIL FROM THE EXCAVATION TO THE BIOCELLS.

12:00 - 14:15 INVESTIGATE POSSIBLE IMPACT REVISED CLEAN UP LEVELS MAY HAVE ON OTHER SITES AT ALPENA CRTC.

14:15 - 14:45 LUNCH.

10/16/95

15:00 - 16:00 OBSERVING UNICO'S ACTIVITIES AT SITE 4. UNICO IS WORKING THE END OF THE STOCKPILED SOIL. IF THEY DO NOT FINISH THE STOCKPILED SOIL TODAY, THEY SHOULD FINISH AT MONDAY. UNICO HAS NEARLY FINISHED THE 1ST WINDROW OF SOIL IN BIOCELL 2. UNICO ESTIMATES EACH WINDROW TO BE 500 - 750 CY.

— END OF DAILY REPORT —

Field Report - Monday
June 19, 1995

By: Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy
Non-Montgomery Watson Personnel:
Dave Newman (Unico / CCC Group) Sp?
Gary Johnson (CCC Group)
Dave Evans (CCC Group) Aimee Keane - CCC Group
Mike Potter (CCC Group)
Arrived Site: 07:45 Left Site: 16:50
Weather: Hot, sunny, 90's of - 100's °F
Equipment on Site: Royer Shredder,
Komatsu PC300LC tracked backhoe,
Komatsu WA420 loader rubber tire,
Komatsu WA380 rubber tire loader,

Field Notes:

8:00 - 10:00 Review project documents.
Called Andy Stempke w/ MDNR.
Asked Andy if generic background metals in soil are still valid in light of revised clean up criteria.
Andy stated that generic background concentrations for metals are still valid.

10:00 - 11:45 Observing Unico's activities at Site 4.
Unico has finished processing all the soil from the stockpile. Unico has moved the shredder so that it is now directly adjacent to the excavation of the concrete pad. Now soil removed from the excavation is fed directly into the shredder. Soil exiting the shredder is taken from the excavation to the biocell by 1 of the 2 loaders.

Unico has completed the 1st windrow of biocell 2. They are now working on the 2nd windrow (filling from west to east).

12:00 - 13:00 Lunch
13:00 - 15:00 Review contract documents.
15:00 - ~~17:00~~ 16:30 At Site 4 observing Unico's activities. Unico has nearly completed filling biocell 2.

- END OF Daily Report -

FIELD REPORT - TUESDAY
JUNE 20, 1995

By: Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy
Non-Montgomery Watson Personnel:
Dave Newman (Unico / CCC Group)
Gary Johnson (CCC Group)
Dave Evans (CCC Group)
Mike Potter (CCC Group)
Aimee Logue (sp?) (CCC Group)
Arrived Site: 0945 Left Site: 16:30
Weather: Sunny, hot, 80's °F
Field Equipment: Rogue Shredder,
Komatsu PC200LC tracked backhoe,
Komatsu WA320 rubber tire loader,
Komatsu WA420 rubber tire loader,

F.B. Notes

07:45 - 10:15 Observing Unico's activities at Site 4. Unico has completed filling biocell 2. Unico constructs biocell 3 (same construction as other 2 biocells). Biocell 3 is located south of biocell 2. The southern wall of biocell 2 and the northern wall of biocell 3 is a common (shared) wall.

07:45 - 10:15 (CONTINUED) Unico is excavating soil from beneath concrete pad (former) at Site 4 using PC300LC backhoe. Excavated soil is fed directly into shredder. Soil exiting shredder is shuttled to biocell by loaders.

It should be noted that construction of Biocells 2, 3 did not include construction of a sump. This will make it more difficult to remove excess water from the biocells in the event of a heavy rainstorm.

Also, construction of Biocell 3 only included a drainage layer on the southern half of the biocell. I suspect Unico feels that because the excavated soil is so sandy that a drainage layer is not necessary. The drainage layer is necessary on the southern half of the biocell so that the loaders have a base to drive on (i.e. the drainage layer prevents the loaders from damaging the HDPE liner).

As mentioned above, the soil being excavated at Site 4 is a very uniform sandy soil (i.e., playbox sand) with little or no organic material.

10:15 - 12:00 As-Built drawings. Develop base maps for Sites 2, 4.

12:00 - 13:00 Lunch

13:00 - 13:45 Continue work on As-Builts.

(6/20/95)

13:45 - 15:45 Observing Unico's activities at Site 4. Unico has nearly completed filling the 1st windrow of Biocell 3. Unico should finish this 1st windrow by the end of the day.

16:15 Called Doug Barber w/ Montgomery Watson - Detroit and updated project progress.

16:30 Left Site to secure materials for As-built drawings.

Note: Captain Kimble was away from the base all day.

— End of Daily Report —

(6/21/95)

FIELD REPORT - WEDNESDAY
JUNE 21, 1995

By: Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy
Non-Montgomery Watson Personnel:
Dave Newman (Unico / CCC Group)
Gary Johnson (CCC Group)
Dave Evans (CCC Group)
Mike Potter (CCC Group)
Himee Rogue (sp?) (CCC Group)

Arrived Site: 07:45 Left Site: 17:00
Weather: Sunny, low 80's °F
Equipment on Job: Rayer Shredder,
Komatsu PC300LC tracked backhoe,
Komatsu WA420 loader (rubber tire),
Komatsu WA380 rubber tire loader

Field Notes:

6:00 - 9:00 Worked on As-Built drawings for Site 4.

9:00 - 11:00 At Site 4 observing Unico's activities. Dave Newman stated the he collected 3 soil samples this morning. The 1st sample was taken from the floor of the excavation (directly below former concrete pad). Dave estimated that the floor of the excavation is 20 - 21 FT below grade. Dave measured ~350 ppm on his PID on this 1st sample. The second sample was collected from the SE corner of the excavation at ~ 5FT above the floor of the excavation. Dave stated this sample measured ~ 1.5 ppm on the PID. The 3rd sample was collected from the stockpiles in Biocell 1. This sample measured ~15 ppm on the PID.

9:00 - 11:00 (CONTINUED) DAVE NEWMAN STATED THAT HE WILL BE USING A GRID SYSTEM TO LABEL SAMPLES FROM THE BIOCELLS. DAVE STATED THAT STATION (0,0) WILL BE AT THE SW CORNER OF BIOCELL 1. GRID COORDINATES WILL INCREASE TO THE NORTH AND EAST.

UNICO IS EXCAVATING SOIL FROM SW CORNER OF EXCAVATION AND FEEDING THROUGH SHREDDER.

11:00 - 11:45 UPDATE CAPTAIN KIMBLE ON PROJECT PROGRESS.

12:00 - 13:00 LUNCH

13:00 - 15:30 OBSERVING UNICO'S ACTIVITIES AT SITE 4. UNICO IS FEEDING SOIL FROM SW CORNER OF EXCAVATION THROUGH SHREDDER.

STRUNG STRING ACROSS EXCAVATION AND MEASURED DEPTH OF EXCAVATION. FLOOR OF EXCAVATION IS ~ 17-18 ft BELOW GRADE.

A TRUCK ARRIVED W/ BAGS OF CONCRETE FOR LEAD STABILIZATION AT SITE 2. THE BAGS WERE TAKEN TO SITE 2 AND UNLOADED.

15:30 - 16:30 CALLED DOUG ERBER W/ MONTGOMERY WATSON - DETROIT AND UPDATED PROGRESS.

DISCUSSED PROJECT W/ CAPTAIN KIMBLE.

— END OF DAILY REPORT —

Field Report - Thursday
June 22, 1995

By: Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy
Non-Montgomery Watson Personnel:
Dave Newman (Unico/CCC Group)
Gary Johnson (CCC Group)
Dave Evans "
Mike Potter "
Aimee Rogue (sp?) "
Arrived Site: 0750 Left Site: 1215
Weather: sunny, 80's °F

Equipment on Job: Royer Shredder,
Komatsu PC300LC tracked backhoe,
Komatsu WA420 rubber tire loader,
Komatsu WA380 rubber tire loader,

Field Notes:
9:30
8:00 - 9:00 At Site 4 observing Unico's activities. Unico is feeding soil from western side of excavation through shredder. Unico is near the end of the 2nd windrow of biocell 3.

Note: 2 of Unico's workers are at Site 2 working on the lead stabilization.

Watched WA420 loader making piles in biocell. WA420 loader has a 4 cy bucket (per Dave Newman). Loader dumps 8-10 buckets per pile (~ 40 cy per pile). There are approximately 13 piles per breech window, and 2 windrows per biocell. Estimate volume of soil per biocell at 1,040 cy. The soil in biocells has been run through shredder and has very little compaction.

8:00 - 9:30 (CONTINUED) ESTIMATE Soil run through shredder takes up ~ 30% more volume than soil in place (per conversations w/ Dave Newman). Therefore estimate the "in place" volume of soil per biocell as

1,040 cy x (1-.30) = 728 cy

9:30 - 10:30 Observing Unico's activities at Site 2. Unico is spreading the bags of portland cement out along the length of the ditch. The portland cement will be mixed into 1 top 1 foot of soil using a rotatiller. ~~Th~~ Once the portland cement is mixed with the soil, the area will be watered down.

10:30 - 11:30 Worked on As-Built drawings.

11:30 - 12:30 Toured Sites 2 & 4 with Captain Kimble and Andy Stempke (MDNR). When we arrived at Site 4, Unico had just broken through a 3" ductile iron water line. Captain Kimble had the appropriate base personnel shut off water through the line. It was later determined that this water line fed the aircraft hangers located north of ~~th~~ Site 4. Captain Kimble stated that because this line was not marked, Unico would not be held responsible for damages.

12:30 - 13:30 Lunch

13:30 - 16:00 Observing Unico's activities at Site 4. Unico has completed filling Biocell 3 and has constructed Biocell 4.

13:30 - 16:00 (CONTINUED) Stopped over at Site C. Dave Newman is working Portland cement into soil using rotatiller. Dave is starting work at the east end of the ditch.

16:00 - 17:15 Worked on As-Built drawings.

— End of Daily Report —

Field Report - Friday
June 23, 1995

By: Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy
Non-Montgomery Watson Personnel:
Dave Newman (Unico/CCC Group)
Gary Johnson (CCC Group)
Dave Evans (CCC Group)
Mike Potter (CCC Group)
Hinree Rogue (sp?) (CCC Group)
Arrived Site: 8:45 Left Site: 16:45
Weather: Sunny, 80's °F
Equipment on Job: Royer Shredder,
Komatsu PC300LC tracked backhoe,
Komatsu WA420 loader w/ rubber tires,
Komatsu WA380 rubber tire loader,
Rotatiller,

Field Notes:

08:00 - 9:00 Working on As-Built drawings
9:00 - 9:30 Observing Unico's activities at Site 4. Unico is working on filling Windrow 1 of biocell 4. Unico is currently doing maintenance/repair work on shredder.

(6/23/95)

9:30 - 1.00 At Site 4 observing Unico's activities. Maintenance / repair of shredder continues sporadically. Still filling window 1 of block 14.

No work currently being done at Site 2.

11:00 - 12:00 Discuss project w/ Captain Kimble

12:00 - 13:00 Lunch

13:00 - 13:30 Worked on As-Builts.

13:30 - 14:30 At Site 2 observing Unico's activities. Unico is tilling the portland cement into the soil using a rotatiller. Unico is working primarily in 1st 300 ft of ditch beginning w/ east end.

14:30 - ~~15:00~~ 16:30 At Site 4 observing Unico's activities. Unico has nearly filled the 1st window of block 14. Captain Kimble has notified me that the length of water pipe that was damaged yesterday will be replaced on Monday (6/26/95).

Visited Site 2. Unico has completed mixing portland cement into soil. Does not look like they have watered.

— End of Daily Report —

Field Report - Monday
June 26, 1995

By: Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy
Non-Montgomery Watson Personnel:
Dave Newman (Unico/CCC Group)
Gary Johnson (CCC Group)
Dave Evans (CCC Group)
Mike Potters (CCC Group)
Himee Rojer (Sp?) (CCC Group)
Arrived Site: 08:00 Left Site: @ 17:00
Weather: 70's °F, cloudy, periods of rain all day
Equipment on Job: Roger Shredder,
Komatsu PC300LC tracked backhoe,
Komatsu WA420 rubber tire loader,
Komatsu WA380 rubber tire loader,

Field Notes:

8:00 - 8:30 Made copy of field notes for Captain Kimble. Copied field notes from 6/16/95 through 6/23/95.

8:30 - 9:30 At Site 4 observing Unico's activities. Unico is excavating soil from western side of excavation and feeding through shredder. Shredded soil is being placed in windrow 2 of biocell 4. The excavation is starting to take shape w/ an ~50 diameter cylinder to 20 FT and sloping sidewalls to surface.

The rain today is really helping dust control. Additionally, the rain is helping keep the moisture content up in the soil in the biocells. Last week, Dave Newman had spoke of watering the biocells if we did not get some rain (the piles were getting too dry). Dave Newman stated that he is trying

8:30 - 9:30
(CONTINUED) to keep the moisture content around 16% - 18%. The RAIN does not really hinder the digging because the soil is so SANDY that the RAIN WATER RUNS right through it (i.e., the RAIN WATER does not form a big puddle at the bottom of the EXCAVATION).

The RAIN should help the LEAD STABILIZATION AT SITE 2. UNICO got the PORTLAND CEMENT mixed INTO the SOIL ON 6/23/95 but did NOT GET the mixture WATERED DOWN. The RAIN should complete the STABILIZATION PROCESS.

Because it is RAINING VERY HARD right NOW, I AM NOT SURE if the WATER pipe that WAS BROKEN ON 6/22/95 will be REPLACED today. The parts are scheduled to be here today but the hard RAIN may prevent WORK.

UNICO has stopped feeding soil through shredder due to lightening in the AREA. UNICO is building berms around the EXCAVATION AND the OPEN side of biocell 4 to prevent RUN IN / RUN OFF.

9:30 - 10:00 CALLED DOUG BARBER W/ MONTGOMERY WATSON - DETROIT. UPDATED DOUG ON project progress.

INSPECTED SITE 2. DITCH is full OF STANDING WATER apparently due to STRAW BALES placed by UNICO at WESTERN end OF ditch.

10:00 - 11:30 AT SITE 4 observing UNICO'S ACTIVITIES. RAIN HAS STOPPED AND UNICO CONTINUES WORK. BASE PERSONNEL INSPECT BROKEN WATER line. BASE PERSONNEL STATE they hope to fix WATER line today if replacement PARTS ARRIVE.

11:45 - 12:45 LUNCH.

13:00 - 15:00 AT SITE 4 OBSERVING UNICO'S ACTIVITIES. UNICO WAS CONTINUING EXCAVATING/SHREDDING SOIL UNTIL THE CONVEYOR BELT ON THE SHREDDER BROKE. DAVE NEWMAN STATES THAT HE WILL TRY TO HAVE A NEW BELT OVERNIGHTED TO THE SITE. DAVE STATES THAT IT IS A VERY EASY PROCESS TO CHANGE OUT THE BELTS. DAVE ALSO STATED THAT HE COLLECTED SAMPLES OF THE STABILIZED SOIL FROM SITE 2 THIS MORNING AND SUBMITTED THE SAMPLES FOR ANALYSIS OF TCLP. WITH THE SHREDDER DOWN, WORK ON THE EXCAVATION STOPS FOR THE DAY. CREW FROM UNICO WORKS ON MISCELLANEOUS ITEMS.

15:30 - 16:30 DISCUSS PROJECT PROGRESS WITH CAPTAIN KIMBLE AND DAVE NEWMAN.

16:30 - 17:00 REVIEW CONTRACT DOCUMENTS.

— END OF DAILY REPORT —

(6/27/95)

Field Report - Tuesday June 27, 1995

By: Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy
Non-Montgomery Watson Personnel:
Dave Newman (Unico / CCC Group)
Gary Johnson (CCC Group)
Dave Evans (CCC Group)
Mike Potters (CCC Group)
Himee Pogue (Sp?) (CCC Group)
Arrived Site: 07:50 Left Site: 17:00
Weather: Cloudy, 70's F, periods of light rain
Equipment on Job: Roper Shredder, backhoe
Komatsu PC300LC tracked ~~excavator~~,
Komatsu WA420 rubber tire loader,
Komatsu WA380 rubber tire loader,

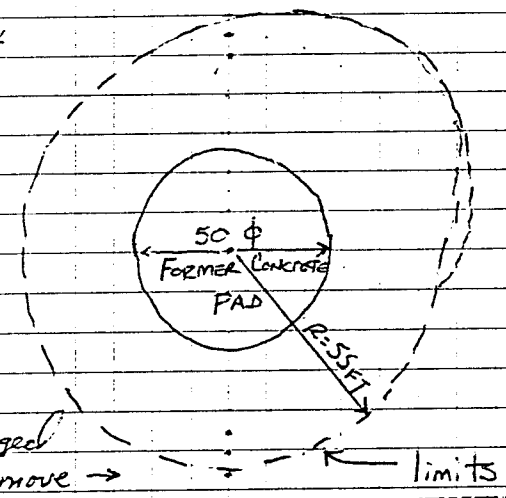
Field Notes:

8:00 - 9:00 Worked on As-Builts
9:00 - 11:00 At Site observing Unico's activities.

Dave Newman states that the replacement conveyor belt for the shredder will not arrive until tomorrow. In the meantime, Unico will try to repair the existing belt.

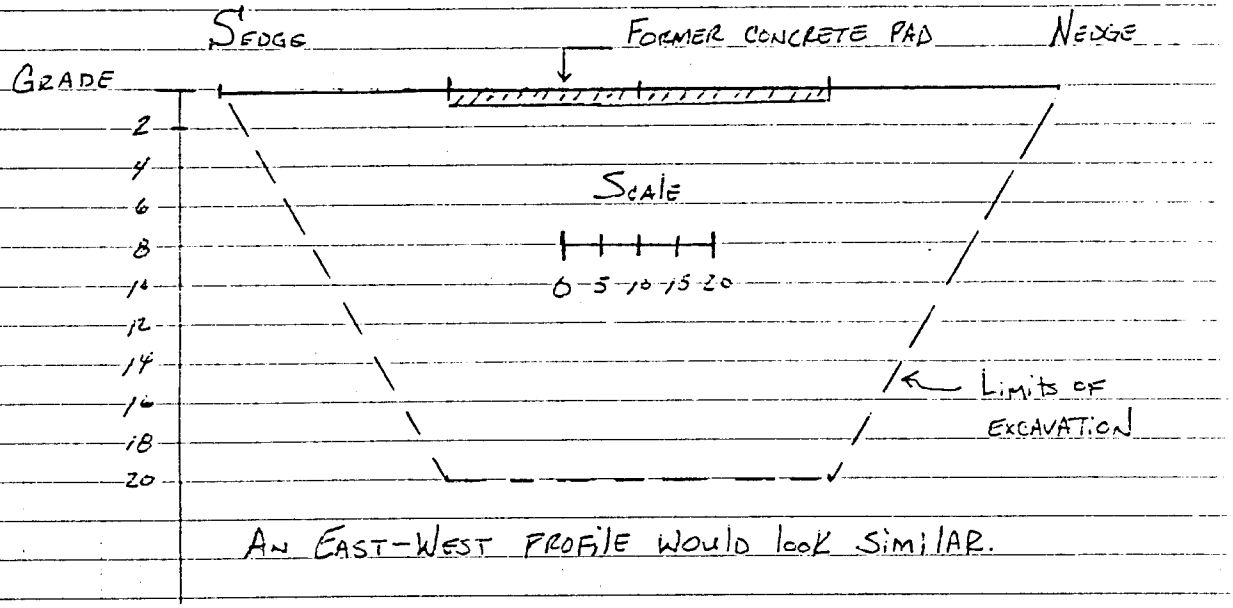
Gary Johnson & myself measure the size of the excavation. A sketch of the plan view of the excavation is as follows:

The limits of the excavation can be thought of as a circle centered on the former concrete pad w/ a radius of 55ft. The circle is irregularly shaped in the NW quarter such that the circumference of the limits of the excavation is ~ 392ft. The excavation was enlarged in the NW quarter to remove →



9:00-11:80 (CONTINUED)

A SKETCH OF THE PROFILE OF THE EXCAVATION IS AS FOLLOWS:



AN EAST-WEST PROFILE WOULD LOOK SIMILAR.

IT IS IMPORTANT TO NOTE THAT PLAN & PROFILE SKETCH'S ARE APPROXIMATIONS AND ARE NOT SURVEYED DRAWINGS.

GARY JOHNSON & MYSELF TAKE PHOTOIONIZATION DETECTOR READINGS OF SOIL ALONG LIMITS OF EXCAVATION AS FOLLOWS:

LOCATION	LOCATION DEPTH (ft)	PID READING (PARTS PER MILLION)
FLOOR OF EXCAVATION	20-21	200-400
EAST WALL	15-16	0-5
SE CORNER	15-16	150-250
SW CORNER/ SW WALL	15-16	0-5
NORTH WALL	15-20	0-5

9:00 - 11:00 (CONTINUED) Dave Newman provides me w/ copy of analytical results for sample collected from bottom of EXCAVATION on 6/21/95. The sample was analyzed for NAPHTHALENE AND 2-METHYLNAPTHALENE. The sample was NON-detect for napthalene (MDL = 330 ppb) and exhibited a 2-methylnapthalene concentration of 2,140 ppb. (~~Above clean up standard~~ this is). Dave stated that he had discussed the sampling result w/ Captain Kimble and that Captain Kimble has instructed him to dig deeper.

11:00 - 12:00 Project Notes.

12:00 - 13:00 Lunch

13:00 - 14:00 Discussed sampling results w/ Captain Kimble. I informed Captain Kimble that MDNR does not have a CLEAN up standard for 2-methylnapthalene and therefore the sample collected from the bottom of the EXCAVATION IS NOT ABOVE MDNR CLEAN up standards. Captain Kimble stated that he still wants to dig deeper.

14:00 - 15:00 At site & observing Unico's activities. Unico is digging soil out from the floor of the EXCAVATION AND STOCKPILING the soil off to the side. Unico has encountered groundwater in the EXCAVATION AT ~ 22-23 FT below grade. Consequently, this is as deep as they will go.

Base personnel have fixed the broken water line. The missing sections of cast iron pipe were replaced w/ galvanized steel pipe.

15:00 - 16:30 Discuss project progress w/ Captain Kimble and Dave Newman.

Confirm w/ Dennis Linsey of MDNR (Gaylord Office) that clean up criteria for 2-methylnapthalene in soil is 330 ppb.

— END OF DAILY REPORT —

(6/28/95)

Field Report - Wednesday
June 28, 1995

By: Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy, Doug Barber
Non-Montgomery Watson Personnel:
Dave Newman (CCC Group)
Gary Johnson (CCC Group)
Dave Evans (CCC Group)
Mike Potters (CCC Group)
Himee Rogue Sp? (CCC Group)
Abe Juarez (Unico Construction)
Bill Botto (Micro Tes)
Buzz Hafer (CCC Group)
Arrived Site: 0:8:00 Left Site: 17:00
Weather: Cloudy, occasional light rain, 60's °F
Equipment on Job: Royer Shacoder,
Komatsu WA PC300LC tracked backhoe,
Komatsu WA420 Rubber tire loader,
Komatsu WA380 Rubber tire loader,

Field Notes:

8:00 - 8:30 Reviewed Sites 2:4 w/ Doug Barber.
8:30 - 9:30 Doug Barber, Captain Kimble, and myself discuss project
9:30 - 10:30 Reviewed project
10:30 - Noon Attended project progress meeting. Meeting was attended by: Captain Kimble, Dave Newman, Gary Johnson, Dave Evans, Mike Potters, Himee Rogue, Abe Juarez, Bill Botto, Buzz Hafer, Doug Barber, and myself. Mtg. was held outside of Unico trailer. Unico was working to repair broken conveyor belt (replacement belt did not arrive).
12:00 - 13:00 Lunch
13:00 - 15:30 Prepared for and attended interview w/ local television station. Interview was conducted by Renee Knott w/ WDKB. Interview was attended by Captain Kimble, Dave Newman, Bill Botto, Abe Juarez, Doug Barber, and myself.

(6/28/95)

13:00 - 15:30 (CONTINUED) Interview included explanations by Captain Kimble, Dave Newman, and Bill Botto on how bioremediation works and how it is being applied to this project. Interview also included visits to Site 2 and Site 4.

15:30 - 17:00 Doug Barber and I toured the base waste water treatment plant (WWTP). WWTP operator explained treatment process. Treatment process includes:

1) Incoming wastewater (solids/water mixture) enters comminutor and is ground up into slurry.
2) Slurry enters ~~aeration~~ aeration tank. Ferric chloride is also mixed w/ the slurry in aeration tank.
3) Slurry passes from aeration tank to clarification tank. Polymer is added to water in clarification tank.

Note: Bacteria are present in aeration tank and clarification tank that eat solids. Form of activated sludge.

4) Clear water passes out of clarification tank through sand filters and into disinfectent tank.
5) UV lights in disinfectent tank kill any bacteria that may be present prior to discharge from plant.

The average flow rate for the plant is ~ 50,000 gallons per day. The maximum design flow rate is ~ ~~20~~ 70 gallons per minute (100,000 gallons per day).

— End of Daily Report —

57
(6/29/95)

Field Report - Thursday
June 29, 1995

By: Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy
Non-Montgomery Watson Personnel:
Gary Johnson (CCC Group)
Dave Evans, (CCC Group)
Mike ~~Reiter~~ Potters (CCC Group)
Aimee Rogue (CCC Group)
Arrived Site: 07:45 Left Site: 17:15
Weather: Cloudy, warm, 70's-80's °F, periods of rain all day
Equipment on Job: Royer Shredder,
Komatsu PC300LC tracked backhoe,
Komatsu WA420 rubber tire loader,
Komatsu WA380 rubber tire loader,

Field Notes:

8:00 - 9:00 Updated project notes.
9:00 - 11:00 At Site 4 observing Unico's activities.

Unico is feeding soil through the shredder. Unico has successfully fixed the broken conveyor belt. Unico is placing the shredded soil into windrow 1 of Biocell 5.

The concrete reinforced pipe for Site 2 has arrived and is stockpiled near site 2.

11:00 - 12:00 Project Notes.
12:00 - 13:00 Lunch
13:00 - 13:45 Drafted Memo to Captain Kimble on Record Keeping.
13:45 - 15:45 At Site 4 observing Unico's activities.
Unico placing shredded soil into windrow 1 of Biocell 5.
16:00 - 17:00 Completed and delivered memo to Captain Kimble on Record Keeping.
Faxed copy to Paul Wheeler.
17:00 - 17:15 Checked on Unico's activities.
Unico is stopping for the day due to lightening strikes.
— End of Daily Report —

FIELD REPORT - FRIDAY
JUNE 30, 1995

By: BEN McGEACHY
MONTGOMERY WATSON PERSONNEL: BEN McGEACHY
NON-MONTGOMERY WATSON PERSONNEL: NONE
ARRIVED SITE: 08:00 LEFT SITE: 2:00
WEATHER: HOT, HUMID, 80's OF
FIELD EQUIPMENT: ROGER SHREDDER,
KOMATSU PC300LC EXCAVATOR,
KOMATSU WA420 RUBBER TIRE LOADER,
KOMATSU WA380 RUBBER TIRE LOADER,

FIELD NOTES:

8:00 - 12:30 DEMOBILIZED. PACKED ALL EQUIPMENT AND FILES FOR HELP TO OFFICE.

CHECKED SITE 2. SITE IS SECURE. REINFORCED CONCRETE PIPE IS STORED ALONG THE ROADSIDE OPPOSITE THE DRAINAGE DITCH. RCP APPEARS TO BE 10 INCH DIAMETER IN 7FT SECTIONS W/ BELL & SPIGOT ENDS W/ INSERTABLE RUBBER GASKET.

CHECKED SITE 4. SITE 4 IS SECURE. EXCAVATION IS SURROUNDED BY ORANGE BARICADE FENCING. BIOCELLS ARE BERMED UP TO PREVENT LEAKS.

2:00 - 6:30 TRAVEL TO DETROIT OFFICE.
6:30 - 9:30 DEMOBILIZE.

(7/6/95)

Field Report - Thursday July 6, 1995

By: Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy
Non Montgomery Watson Personnel:
Dave Newman (CCC Group)
Gary Johnson (CCC Group)
Hiree Logue (Sp?) (CCC Group)

Arrived Site: 10:30 Left Site:
Weather: Cloudy, 70's °F
Equipment on Job: Royer Shredder,
Komatsu PC300LC excavator,
Komatsu WA420 rubber tire loader,
Komatsu WA380 rubber tire loader,

Field Notes:

9:30 - 10:30 Travel to airport. Fly to site.

10:30 - 11:45 At site & observing Unico's activities. Unico is working on Royer Shredder. Unico will be cleaning several spray nozzles.

Unico has nearly completed the 2nd windrow of soil in biocell 5.

Drove by Site 2. No additional work has been completed. Unico has had surveyors stakes placed marking elevations for the storm piping to be installed. However, no piping has been installed.

12:00 - 13:30 Lunch / Meeting w/ Captain Kimble Discussed project progress. Explained to Captain Kimble that Montgomery Watson intends to conduct weekly visits on Fridays. If Captain Kimble wants us to be here on a different day he will call Doug Barber.

(7/6/95)

13:30 - 14:30 At Site 4 observing Unico's activities. Unico is working on spray nozzles on Rojer Shredder.

No soil has been removed/treated from the gully.

14:30 - Discussed project w/ Captain Kimble. Passed on information given to me by Dave Newman. Specifically,

1) ITCLP for lead confirmatory sample from Site 2 came back at 8ppb (regulatory limit is 4 ppb). Unico is considering retesting using SPLP. The other 3 confirmatory samples were less than 3ppb.

2) Unico will be looking to ANG for help supporting/bracing water line that runs through Site 4.

Field Report - Friday
July 14, 1995

By: Ben McGeachy

Montgomery Watson Personnel: Ben McGeachy

Non-Montgomery Watson Personnel:

Dave Evans	CCC Group
Mike Potters	CCC Group
Gary Johnson	CCC Group
Himee Rogue (sp?)	CCC Group

Arrived Site: 10:30 Left Site: 14:30

Weather: Sunny, hot, & humid, 90's °F

Equipment on Job: Royer shredder, Komatsu PC300LC excavator, Komatsu WA420 rubber tire loader, Komatsu WA380 rubber tire loader

Field Notes:

7:30 - 10:30 Travel to ~~Site~~ Airport. Fly to Site.

10:30 - 12:00 Inspect Unico's activities. No further work has been completed at Site 2. Reinforced concrete pipe is stockpiled awaiting installation. Gary Johnson states that RCP installation will be one of the last items completed. Unico is nearly complete with the excavation beneath the concrete pad at the old fire training area (Site 4). Unico is working on Biocell #8. Unico will next move to excavating the old fuel pipeline at Site 4. In order to excavate the fuel pipeline a section of water line (that cuts across the area to be excavated) will be shut off and removed.

13:00 - 14:30 Discussed project with Captain Kimble. Received copy of base NPDES permit and recent analytical data.
14:30 - 18:30 Traveled to Airport. Flew to Detroit. Traveled to office.

Field Report - Friday
July 21, 1995

By. Mark Clark
Montgomery Watson Personnel: Mark Clark
Non-Montgomery Watson Personnel:
Dave Newman CEC Group
Arrived Site: 11:15 AM
Weather: Sunny, 80's °F
Equipment on Job: Keyer Shredder, Komatsu PC300LC excavator, Komatsu WA420 rubber tire loader, Komatsu WA380 rubber tire loader

Field Notes
7:30 - 11:00 Travel to Airport. Fly to site.
11:15 - 11:20 Civil Engineering Building 2. Left TPH calculations with receptionist. to be delivered to Fred Kimble.
11:20 - 12:30 Drove to site 4. Excavation and processing in progress. Excavation is taking place on south end of the site. Dave Newman is delivering samples to the laboratory. Took a site walkover. →

EXCAVATION HAS A 4" CAST IRON PIPE RUNNING through THE MIDDLE IN AN EAST/WEST DIRECTION. The PIPE IS ABOUT 6-8FT below GRADE, AND SUPPORTED WITH SAND FILL. THE NORTHERN PORTION OF THE EXCAVATION HAS POOLED WATER.

TWELVE biocells ARE complete. CURRENTLY ADDING to pile 13. Soil is missing from both ENDS of pile 4.

12:30-13:30 LUNCH.

13:30-17:30 Returned to SITE 4. MET WITH DAVE NEWMAN. DAVE shows me around SITE 4. He explains that Biopiles 1 through 4 WERE TESTED AND FOUND to be CLEAN. TEST ARE still pending on ~~Biocells~~ Biopiles 5 through 12. Soil WAS taken from Biopile 4 to support WATERMAIN IN EXCAVATION

DROVE to SITE 2. DITCH IS EXCAVATED AND APPROXIMATELY 100FT OF CONCRETE PIPE HAS been PLACED AND COVERED. There is STANDING WATER IN the EXCAVATION. EXCAVATION WORK is tidy.

Returned to SITE 4. EXCAVATOR HAS CUT WHAT APPEARS to be a 50 pair copper telephone CABLE. FLAGS ARE checked. Utility flags →

in the immediate area of the line break are missing (heavy traffic area). It would appear that the phone line is at least 8 feet inside of the original barricade fence.

Dave and I drove to Building 2 where Jeff Chizim was informed of the break. Returned to the site, where three gentlemen from the ANG inspected the cable. It is the phone cable to the northern hangers.

Jeff Chizim returned to Site 4 and directed Dave to get GTE to come and work on it immediately. Dave and Captain Kimble could work out details of who would pay on Monday. A call was placed in to GTE and service was ordered.

15:45 Two service men from GTE arrive and begin to repair the phone line.

16:30 Site personnel stop excavating and begin to clean equipment. Discussed with Dave Newman if there would be any special needs this following week. Dave relayed that they did not anticipate needing MW's assistance this next week. He did remind me of a progress meeting July 31, 1995.

17:00-18:00 Dinner

18:00-21:00 Flight to Detroit. Travel to office.

Field Report - Wednesday
July 26, 1995

By: Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy
Non-Montgomery Watson Personnel:

Dave Newman	CCC Group
Gary Johnson	CCC Group
Mike Potters	CCC Group
Dave Evans	CCC Group
Himee Rogue (Sp?)	CCC Group

Arrived Site: 10:30 Left Site: 16:30
Weather: Sunny, hot, 90's °F
Equipment on Job:
Royer Shredder (being shipped off-site),
Komatsu PC300LC excavator,
Komatsu WA 420 rubber tire loader,
Komatsu WA 380 rubber tire loader,

Field Notes:

10:30 - 12:00 Inspected work at Sites 2 and 4.

Unico has completed installation of storm piping at Site 2. Unico is backfilling above piping using excavator to spread sand. Unico still needs to spread topsoil.

10:30 - NOON (CONTINUED) At Site 4, excavation beneath the FTA concrete pad and fuel line is complete. Unico is preparing to begin backfilling using soil from Biocell #2. A total of 10 biocells were constructed.

12:00 - 13:00 Lunch w/ Captain Kimble. Discussed project progress.

13:00 - 15:30 Met w/ Dave Newman. Dave states that he has collected and analyzed all confirmatory samples. I ask Dave for copy of analytical results. Dave and I take measurements at Site 4 to try to estimate volumes of excavations.

15:30 - 16:30 Met w/ Captain Kimble and Dave Newman to discuss project.

16:30 - 17:30 Project notes.

17:30 - 21:00 Travel to Alpena Airport. Fly to Detroit. Travel to office.

— End of Daily Report —

Field Report - Monday
July 31, 1995

By: Ben McGeachy

Montgomery Watson Personnel: Ben McGeachy,
Doug Barber

Non Montgomery Watson Personnel:

Dave Newman	CCC Group
Gary Johnson	CCC Group
Dave Evans	CCC Group
Elliot Brown	CCC Group
Buzz Hafer	CCC Group
Abe Juarez	Unico Constr.

Arrived Site: 0800 Left Site:

Weather: Sunny, hot, 90's °F

Equipment on Job: Komatsu D83E bull dozer,
Komatsu WA380 rubber tire loader,
Komatsu WA420 Rubber tire loader,

Field Notes:

(Traveled to site on 7/30/95 from 18:30 - 22:00.)

Arrived at site at 8:00 on 7/31/95.
8:00 - 8:30 Met w/ Captain Kimble.
8:30 - 10:00 Conducted site walkover at Sites 2 & 4. Worked on As-Built drawings. Spoke w/ Dave Newman. Dave stated that Captain Kimble had asked him to prepare a drawing showing sample locations and depths. Dave stated that he has not worked on that drawing. Also asked Dave if he had sampling for Site 4 sidewalls. Dave stated that he would get me results.

NOTE: WHEN REVIEWING SITE 2 IT WAS NOTED THAT THE END OF THE STORM PIPE WAS IN A LOW AREA. (I.E., DURING A RAIN THE END OF THE PIPE WILL FILL W/ WATER AND SEDIMENT). THE LENGTH OF DITCH FROM THE END OF THE STORM PIPE TO THE RIVER COULD BE DUG OUT TO CORRECT THIS PROBLEM.

10:00 - 12:00 ATTENDED PROGRESS MTG W/ DOUG BARBER, CAPTAIN KIMBLE, KARIN GREENLEE (USPFO), DAVE NEWMAN, ABE JUAREZ, AND BUZZ HAFER. SOME ITEMS DISCUSSED INCLUDED:

1. UNICO/CCC GROUP FEELS THAT THEY HAVE EXCAVATED 17,000+ CY FROM SITE 4. MY VOLUME CALCULATIONS SHOW UNICO HAS EXCAVATED ~ 13,000 CY FROM SITE 4. THIS ISSUE WAS NOT RESOLVED.
2. EXPLAINED TO CAPTAIN KIMBLE THAT MONTGOMERY WATSON COULD NOT COMMENT ON CONFIRMATORY SAMPLING BY UNICO/CCC GROUP W/O A MAP SHOWING SAMPLE LOCATIONS & DEPTHS. DAVE NEWMAN STATED THAT HE WOULD PREPARE SUCH A DRAWING WITHIN THE NEXT WEEK.
3. CONFIRMED THAT UNICO/CCC GROUP WOULD SUPPLY INFORMATION (ELEVATIONS, ETC...) ON STORM PIPING AT SITE 2 FOR AS-BUILTS.
4. TENTATIVELY SCHEDULED THE FINAL INSPECTION MTG. FOR AUG. 16TH, 1995.

12:00 - 13:00 Lunch w/ Doug Barber, Captain Kimble, and Karin Greenlee.
13:00 - 14:30 Inspected Sites 2, 3, 4 w/ Doug Barber, Captain Kimble, and Karin Greenlee.
14:30 - 20:00 Traveled to Detroit office.

— End of Daily Report —

Field Report - Monday
August 7, 1995
By: Ben McGeachy
Montgomery Watson Personnel: Ben McGeachy
Non-Montgomery Watson Personnel:

Dave Newman	CCC Group
Gary Johnson	CCC Group
Dave Evans	CCC Group
~~La~~ Worker	CCC Group

Arrived Site: 10:45 Left Site: 14:45
Weather: Mostly cloudy, 90's °F
Field Notes:

10:45 Met w/ Sharon (receptionist) in base engineering. Sharon states that Cptn. Kimble would like to conduct final inspection mtg. on Monday, August 14, 1995. I stated that I would check w/ Doug Barber (MW) and Dave Newman (CCC Group).

11:00 Met w/ Dave Newman. Dave states that he has no problems w/ Final Inspection on 8/14/95 at 11:00 AM. Dave is confident that all work will be completed ~~pri~~ by end of week (i.e., by 8/11/95).

Dave provides me with sketches showing sample locations at Sites 2 & 4 and slope of storm piping at Site 2.

Captain Kimble had previously asked that I check specifications for required topsoil over storm piping at Site 4. The storm piping was a contract addition that was handled between the A.N.G. & Unico. I am unable to find specifications for this work. I asked Dave how much topsoil he intends to put at Site 2. Dave states that he intends to put down 4" of topsoil. I stated that Captain Kimble stressed that all disturbed areas get topsoil & grass seed.

11:30 Called Doug Barber w/ MW-Detroit. Doug can attend Final Inspection meeting on 8/14/95 at 11:00 AM.

11:45 Confirmed w/ Sharon that Final Inspection mtg. on 8/14/95 at 11:00AM will work for Dave Newman & Doug Barber. Sharon will contact Karin Greenlee w/ USPFO to see if 8/14/95 works for her.

12:45 - 13:45 Review project documents. Project notes.

13:45 Spoke w/ Sharon at Base Engineering. Sharon stated that she had spoken to Karin Greenlee regarding the Final Inspection. Karin indicated that she typically does not attend Final Inspections and is not planning to attend this Final Inspection. Therefore, the Final Inspection will be held on 8/14/95 at 11:00 AM. Sharon will notify Captain Kimble when he calls into the office (Captain Kimble is away on business All week).

14:00 I notified Dave Newan of Final Inspection date & time.

Backfill at Site 4 is nearly complete. A small area around the old fuel pipeline still needs backfiling. The entire area needs to be topsoiled & seeded.

At Site 2, the topsoil needs to be spread out evenly and the area needs to be seeded.

Additional work to be completed at Site 4 includes collecting and disposing of plastic liners used for construction of biocells.

Equipment on Job: Komatsu D83E bulldozer,
Komatsu WA420 Rubber tire loader,
Komatsu WA380 Rubber tire loader,

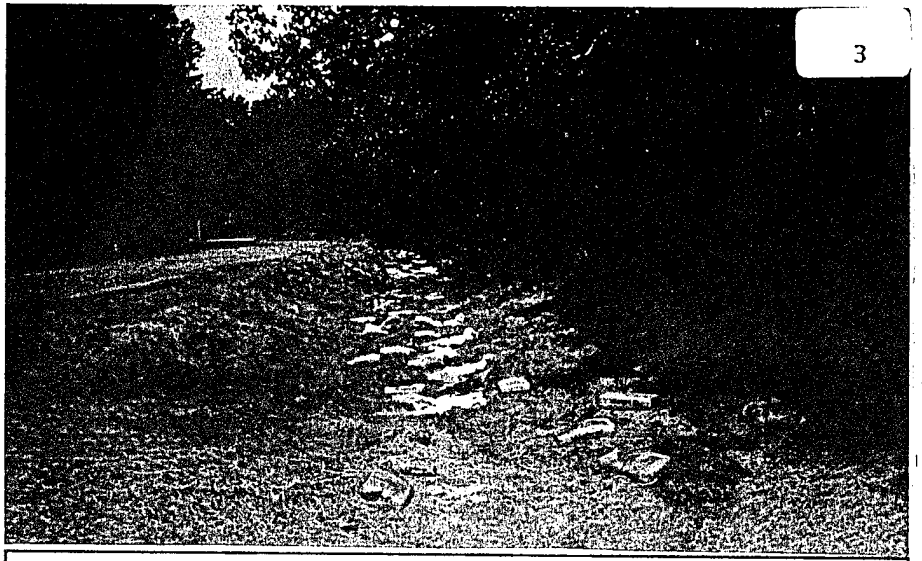
— End of Daily Report —

E

PHOTOGRAPHS

Site 2. Drainage ditch prior to remediation activities.
Photo Date: 5/24/95. Photo Direction: W.

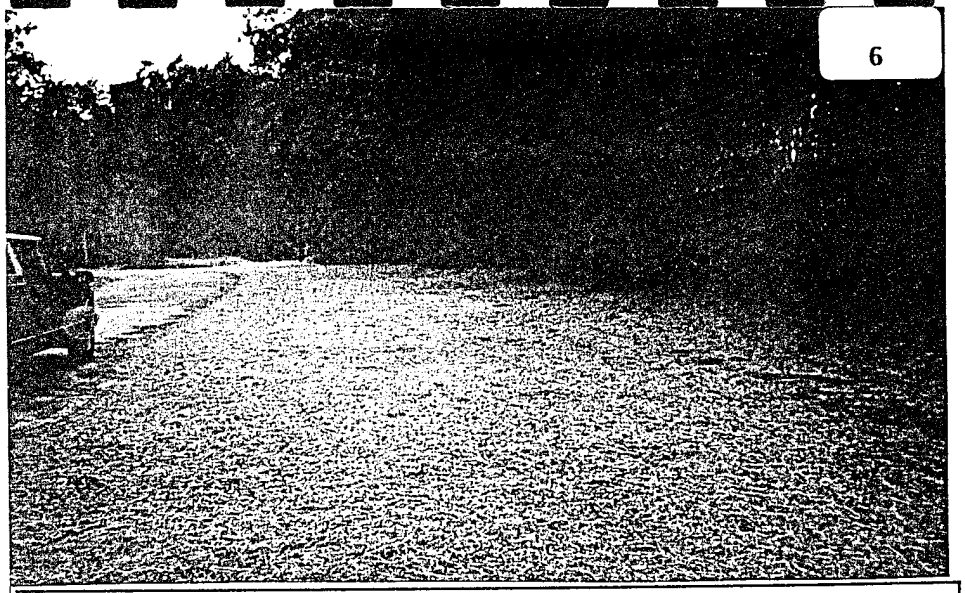
Site 2. In-Situ Bioremediation.
Photo Date: 6/2/95. Photo Direction: W.



Site 2. Bags of dry cement to be mixed with impacted soil (i.e., stabilization). Photo Date: 6/22/95. Photo Direction: W.

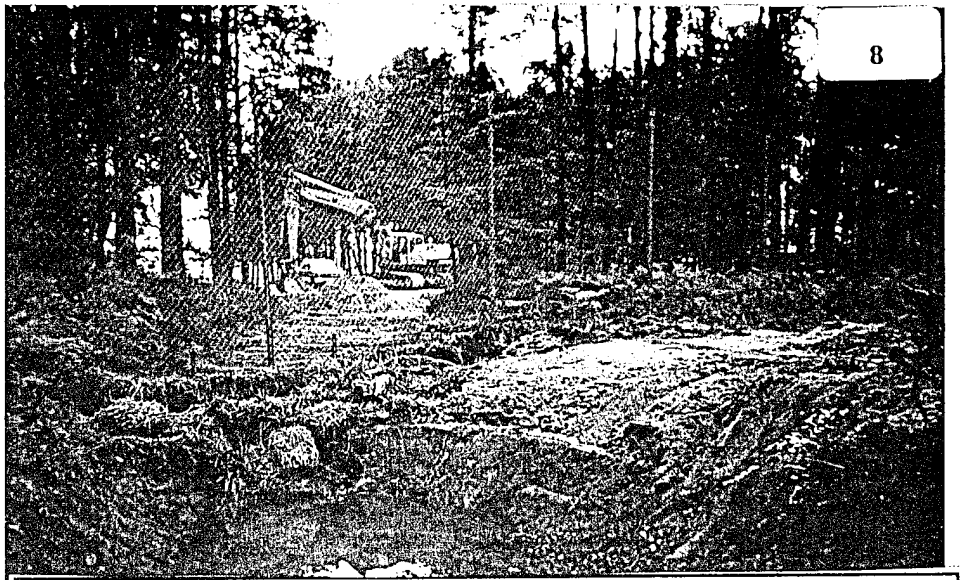
Site 2. Mixing dry cement with impacted soil.
Photo Date: 6/22/95. Photo Direction: W.

Site 2. Sand backfill being placed above RCP storm piping. Gate valve access box in foreground. Photo Date: 7/26/95. Photo Direction: W.



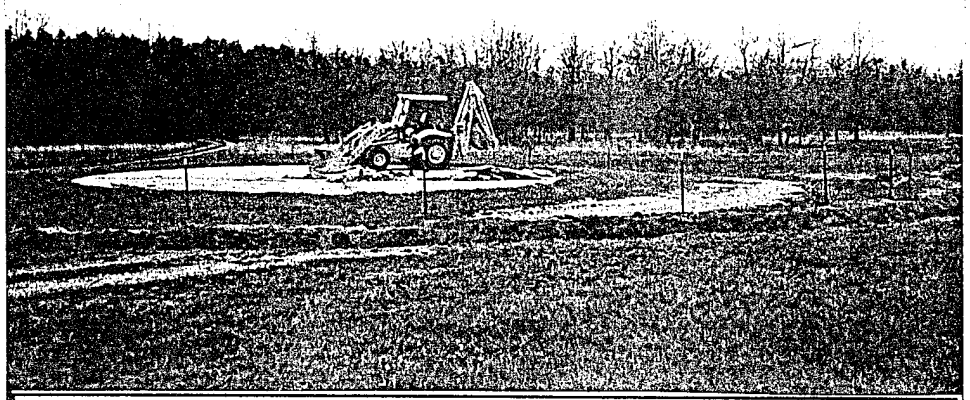
Site 2. Drainage ditch following completion of remediation activities. Photo Date: 8/14/95. Photo Direction: W.

Site 2. Drainage ditch following completion of remediation activities. Photo Date: 8/14/95. Photo Direction: NW.



Site 2. Terminus of RCP storm piping (under standing water in foreground). Photo Date: 7/26/95. Photo Direction: SE.

9

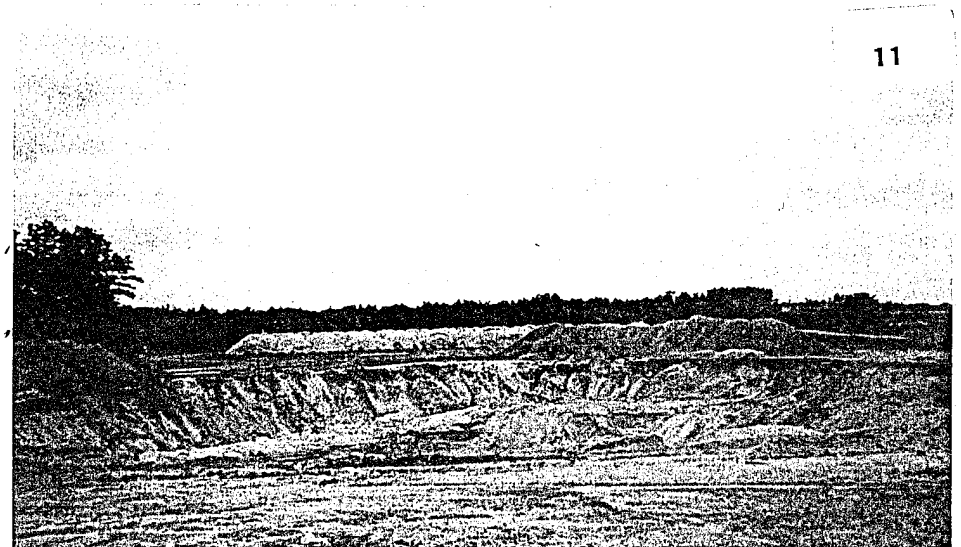


Site 4. Concrete pad at Fire Training Area prior to remediation activities. Photo Date: 5/24/95. Photo Direction: W.

10

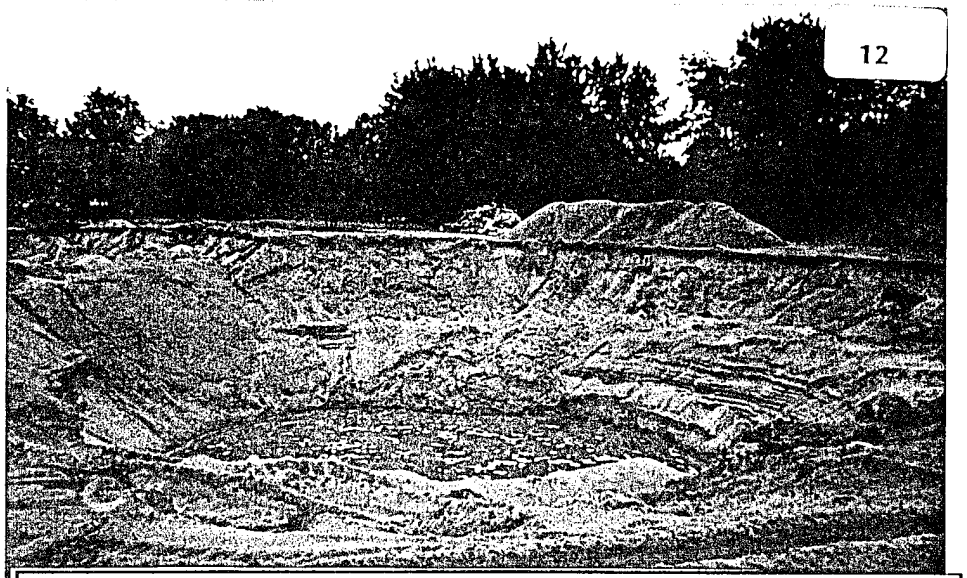
Site 4. Excavation in the area of the former concrete pad.
Photo Date: 6/13/95. Photo Direction: S.

11



Site 4. Excavation in the area of the former concrete pad. Water line piping in foreground; biocells in background. Photo Date: 7/26/95. Photo Dir.: NW.

12

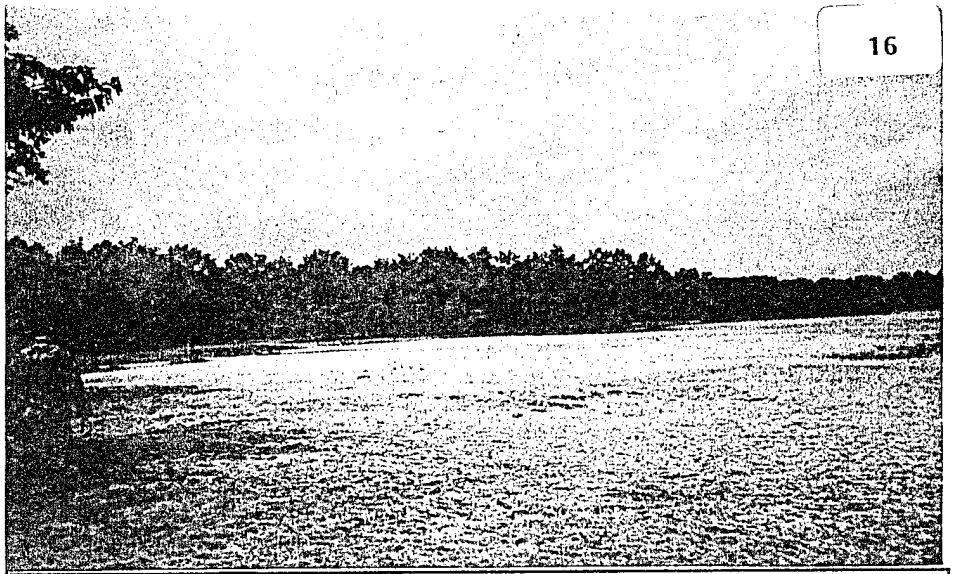


Site 4. Excavation in the area of the former concrete pad. Water table at approximately 20 to 25 ft below grade. Photo Date: 7/26/95. Photo Direction: SW.

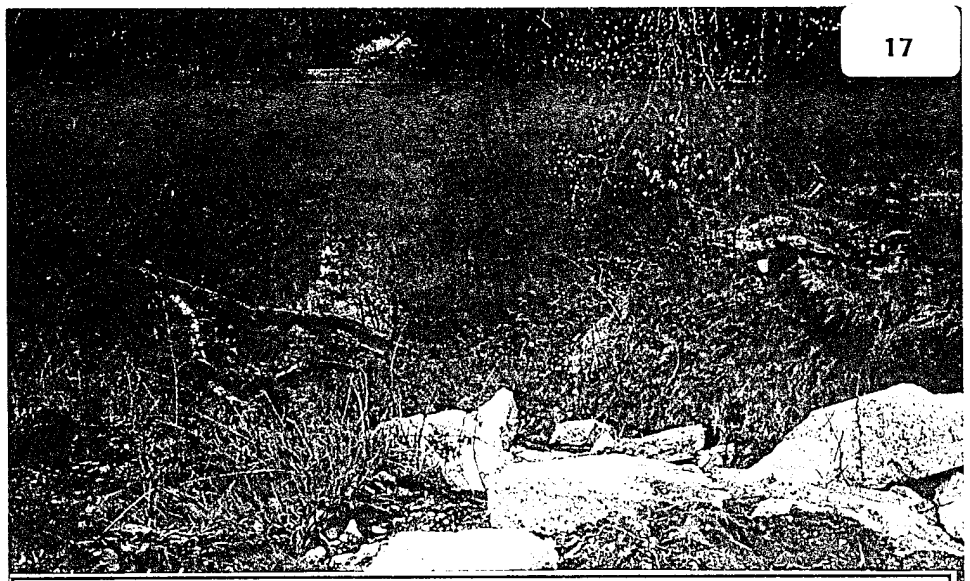
Site 4. Demolition of block pit.
Photo Date: 5/24/95. Photo Direction: W.

Site 4. Excavation of the block pit and fuel line (piping in foreground).
Photo Date: 6/22/95. Photo Direction: S.

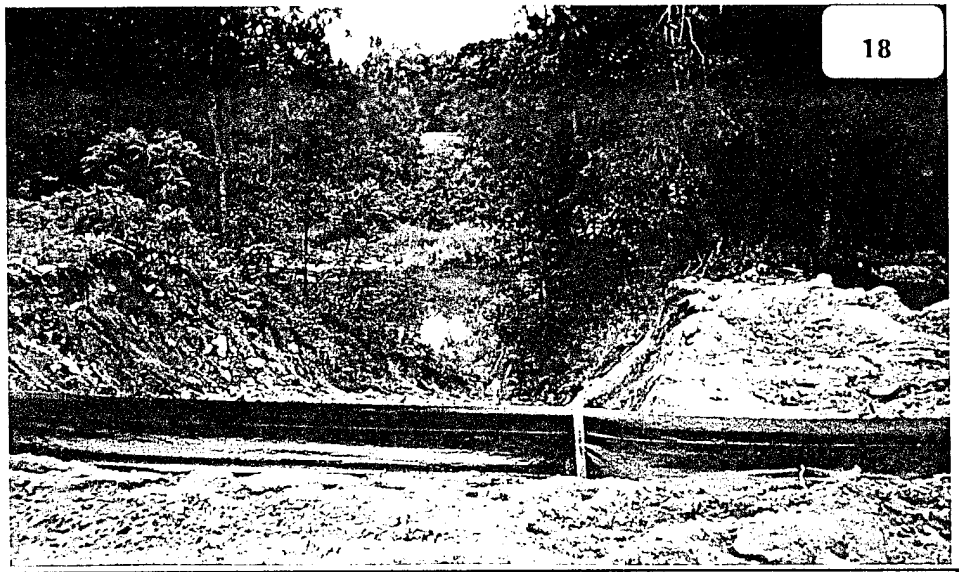
Site 4. Excavation in the area of the former fuel line.
Photo Date: 7/26/95. Photo Direction: S.



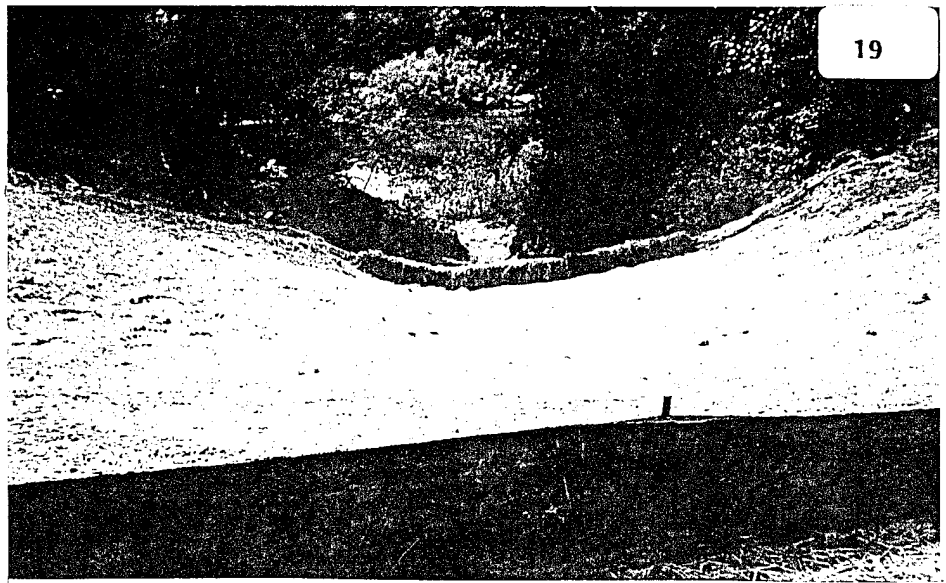
Site 4. Area of the former concrete pad, block pit, and fuel line after completion of remediation activities. Photo Date: 8/14/95. Photo Direction: NW.



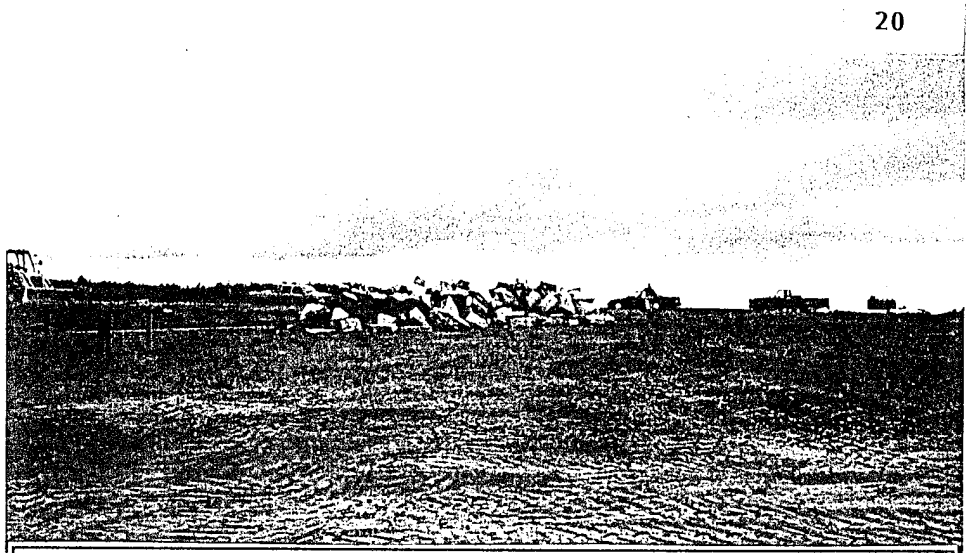
Site 4. Gully to the sinkhole prior to remediation activities.
Photo Date: 5/24/95. Photo Direction: S.



Site 4. Excavation of the gully. Silt fence prevents erosion from the excavations from entering the sinkhole. Photo Date: 7/26/95. Photo Direction: S.

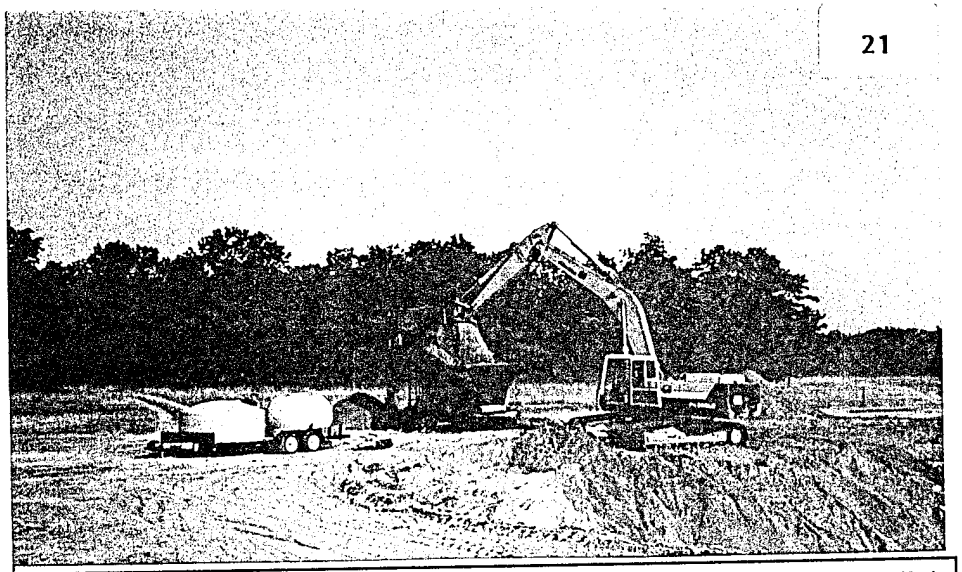


Site 4. Gully to the sinkhole following remediation activities.
Photo Date: 8/14/95. Photo Direction: S.



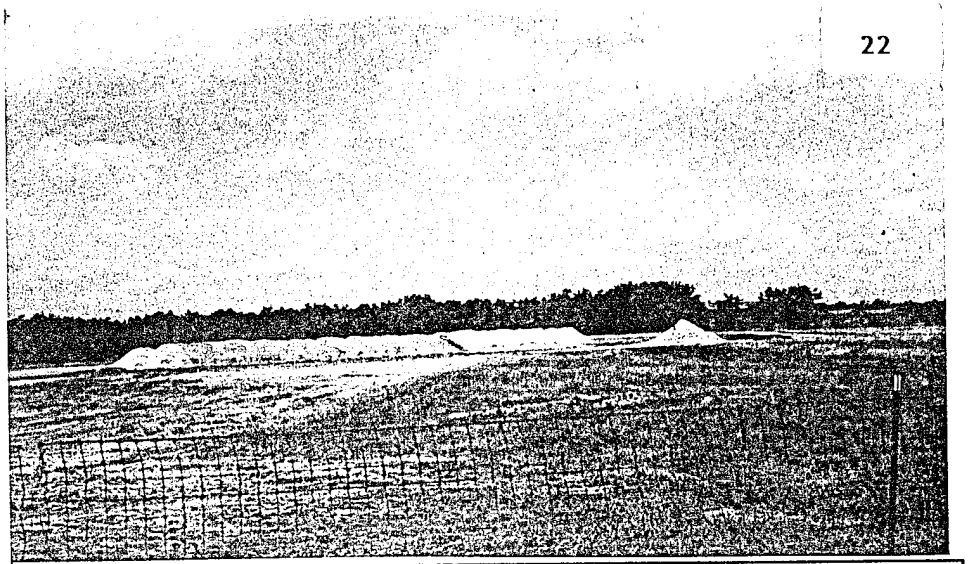
Site 4. Construction debris from the area of the gully and the former concrete pad awaiting disposal. Photo Date: 5/24/95. Photo Direction: E.

21



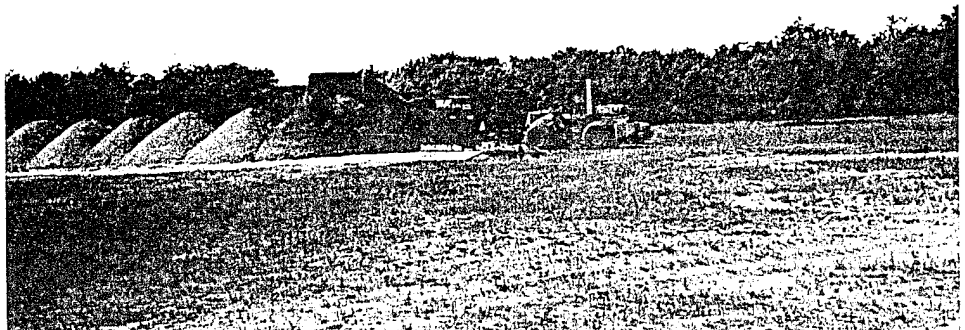
Site 4. Impacted soil being fed into the shredder. Impacted soil is inoculated with bacteria/nutrient solution. Photo Date: 6/22/95. Photo Direction: S.

22



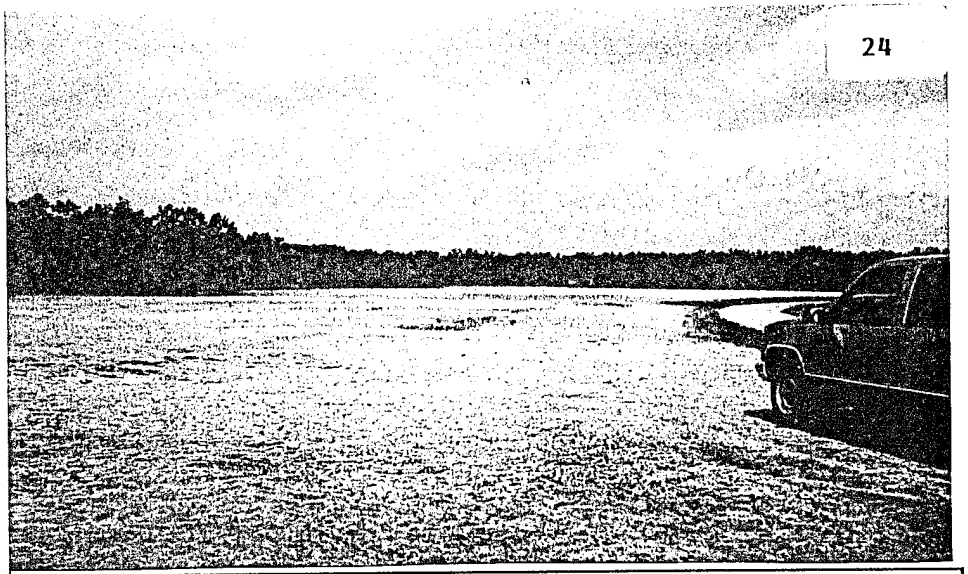
Site 4. Biocells located north of excavations. Typical biocell is 200ft x 50ft and holds 1,000 - 1,500 cyds. of soil. Photo Date: 7/6/95. Photo Direction: N.

23



Site 4. Shredder discharging soil inoculated with bacteria/nutrient solution directly into biocell. Photo Date: 6/13/95. Photo Direction: NW.

24



Site 4. Area of the former biocells following completion of remediation activities. Photo Date: 8/14/95. Photo Direction: N.

F

UNICO'S AIR EMISSIONS ESTIMATE

AIR EMISSIONS ESTIMATE

Bioremediation System
Michigan Air National Guard CRTC

* * *

Prepared for:

Michigan Air National Guard CRTC

* * *

Prepared by

Unico Construction Company
San Antonio, Texas
April 1995

EMISSIONS ESTIMATE

The Michigan Department of Environmental Resources (MDNR) was contacted concerning potential air emissions and the necessity for an air permit for the work to be performed at the Alpena ANG Sites 2 and 4 by Unico Construction Company (Unico). Mr. Rick Alexander with the MDNR stated that Rule 201 requires a permit for all activities that may emit an air contaminant. He also stated that Rule 290 exempts any process or equipment that emits only noncarcinogenic volatile organic compounds. A copy of the MDNR Air Quality Division Part 2. R336.1290 Rule 290 is attached.

Unico's bioremediation system involves the use of a Royer soil shredder especially equipped with computer-controlled spray bars for applying the microbial mixture. As stated in Unico's Bioremediation System Design and Work Plan, the contaminated soil is excavated and placed directly into the Royer hopper. The soil travels up the feed conveyor and is dropped onto the shredder belt. The shredder belt particlizes the soil and ejects it out of the machine. As it is ejected, it is immediately sprayed with the microbial mixture. This microbial mixture contains hydrocarbon-degrading bacteria, water, and nutrients. The mixture is atomized and applied to the soil in the appropriate amounts per the manufacturers recommendations and bench-scale studies. The Royer is closed except for the hopper and feed belt. The design is intended to limit the air emissions by enclosing the contaminated soil. Volatilized hydrocarbons tend to be pulled into the machine by convection and ejected with the soil. Therefore, the air as well as the soil, is saturated with the hydrocarbon-degrading spray mixture. By saturating the soil and air with this mixture, air emissions including particulates are reduced to non-detectable levels.

As stated in the Bioremediation System Design, the hydrocarbon contaminants from Site 2 and Site 4 at the Alpena ANG will be degraded primarily by an alkane oxidation reaction. This type of reaction produces carbon dioxide, water, and fatty acids as the end products of the bioremediation process. A flow diagram of this reaction is attached. Based on this reaction, and the current MDNR air standards, no contaminants will be emitted to the air. Therefore, no MDNR air permit is required for the bioremediation process.

The physical process of particlizing the soil to prepare it for bioremediation has been proven to emit only minuscule quantities of combustible hydrocarbons. Past studies performed to identify and quantify air emissions from this process involved the use of a Photoionization Detector (PID) to quantify the combustible hydrocarbons present near the Royer during operation. The PID is a non-discriminating tool that will detect Volatile Organic Compounds in the air. These compounds may be from the bioremediation process or the diesel engines used to excavate the soil. Although it is not a precise or specific method, the PID results do indicate that air emissions are reduced by 50% by using the spray bar system. The results of a study by Ogden Environmental performed to measure the quantity of air emissions released by the Royer are attached.

Mr. Alexander stated that information or supporting data was not required for submittal to the MDNR to obtain an air permit exemption. He also stated that the MDNR would not provide a certificate of exemption. According to Mr. Alexander, it is Unico's responsibility for determining their exemption to the air emissions permit. Specifically, MDNR regulation R 336.1290 Rule

290 states "the permit system does not apply to any process or process equipment that emits only noncarcinogenic volatile organic compounds if all of the following provisions are met:

a.) The uncontrolled emissions of volatile organic compounds do not exceed 1,000 pounds per month.

b.) A description of the process and equipment is maintained throughout the life of the process or process equipment.

c.) Records of material use and calculations identifying the quality, nature, and quantity of the volatile organic compound emissions are maintained in sufficient detail to demonstrate that the emissions are not more than 1,000 pounds per month."

Unico will comply with Rule 290 of Michigan Act 348 by maintaining a description of the process and equipment throughout the life of the process or process equipment and by maintaining records of material use and calculations identifying the quality, nature, and quantity of the VOC emissions in sufficient detail to demonstrate that the emissions are not more than 1000 lbs per month. Unico will use a Photoionization Detector (PID) to monitor the VOC emissions. These records will be maintained on file for the most recent 2-year period and will be made available to the air quality division upon request.

Although manufacturers information and testimonials indicate that only minuscule quantities of VOCs will be emitted from the Royer process, an emissions estimate was performed. This estimate was developed using analytical results presented in the Source Removal Action Plan (SRAP) Earth Tech, June, 1994, and a memorandum written by Montgomery Watson regarding the air emissions.

The potential air emissions resulting from the Royer process were estimated as follows: the areas to be excavated were divided into subareas using the analytical results from the SRAP and a representative Total Petroleum Hydrocarbon (TPH) concentration was assigned to each area, assuming TPH represents the fuel. The TPH present in each subarea was determined as follows:

$$\text{TPH (lbs)} = \text{TPH (mg/kg)} \times \text{Density of Soil (lbs/ft}^3\text{)} \times \text{Volume of Subarea (ft}^3\text{)}$$

Where

TPH = mg TPH/kg soil, Density of Soil = 120 lbs/ft^3, and 1 kg of soil = 2.205 lbs of soil.

The pounds of TPH from each subarea in Site 4 and Site 2 were added together to get the total pounds of TPH, as follows:

SITE 4 CONCRETE PAD

Note: Volume of Concrete pad = ¶r²h, where r = 25 ft and h = depth of excavation

SUBAREA	AVE. TPH (mg/kg)	DEPTH	VOLUME FT³	LBS OF TPH
1	2100	0 - 5′	9817	2474
2	1450	5′ - 10′	9817	1708
3	1450	10′ - 15′	9817	1708
4	1350	15′ - 20′	9817	1590
5	13	20′ - 25′	9817	15
		TOTAL = 7495 lbs		

SITE 4 PIPELINE

Note: Volume of Pipeline = 5 ft wide x depth x 200 ft long

SUBAREA	AVE. TPH (mg/kg)	DEPTH	VOLUME FT³	LBS OF TPH
1	100	0 - 10′	10000	120
2	150	10′ - 20′	10000	180
		TOTAL = 300 lbs		

SITE 4 GULLY

Note: Volume of Gully = 80 ft long x 20 ft wide x 1 ft deep

SUBAREA	AVE. TPH (mg/kg)	DEPTH	VOLUME FT³	LBS OF TPH
1	100	0 - 1′	1600	19

SITE 2 DRAINAGE DITCH

Note: Volume of Ditch = 150 ft long x 20 ft wide x 1 ft deep

SUBAREA	AVE. TPH (mg/kg)	DEPTH	VOLUME FT³	LBS OF TPH
1	460	1	3000	166

Total pounds of TPH at Site 4 is 7,814 lbs. Total pounds of TPH at Site 2 is 166 lbs. Because the TPH contamination originated primarily from JP-4 jet fuel, w assumed that the TPH is composed of approximately 20% volatile and 80% non-volatile constituents. Based on the Royer information attached, the spray system reduces the quantity of VOCs by 50%. Therefore, the total pounds of TPH from Site 4 x 20% VOC x 50% reduction = the total VOCs emitted by the bioremediation process at Site 4. Hence,

Total VOCs emitted at Site 4 = 7,814 lbs x 0.20 x 0.50 = 782 lbs.

According to the work plan, the soils at Site 2 are to be remediated in-place. However, if the soils were to be processed through the Royer the emissions would be as follows:

Total VOCs emitted at Site 2 = 166 lbs x 0.20 x 0.50 = 17 lbs

782 lbs (Site 4)+ 17 lbs (Site 2) = 799 lbs Total, 799 lbs < 1000 lbs

Based on this estimate, Unico will be below the MDNR limit of 1000 lbs of VOCs per month. Moreover, the bioremediation process is expected to take at least 2 months, resulting in a monthly emissions rate well below the state limit.

As part of our monitoring and record keeping of the bioremediation process, Unico will monitor the emissions from the Royer daily using a PID. This information will be recorded and total VOC emissions will be calculated. Although Unico does not anticipate substantial VOC emissions from this operation, engineering controls such as a tarp over the exhaust or additional spraying, will be implemented to reduce VOCs, if necessary.

>

R 336.1290 Permit system exemptions; sources with limited emissions.

Rule 290. The permit system does not apply to any process or process equipment that emits only noncarcinogenic volatile organic compounds if all of the following provisions are met:

(a) The uncontrolled emissions of volatile organic compounds do not exceed 1,000 pounds per month.

(b) A description of the process and equipment is maintained throughout the life of the process or process equipment.

(c) Records of material use and calculations identifying the quality, nature, and quantity of the volatile organic compound emissions are maintained in sufficient detail to demonstrate that the emissions are not more than 1,000 pounds per month.

(d) The records are maintained on file for the most recent 2-year period and are made available to the air quality division upon request.

>

BIOREMEDIATION MECHANISM

Petroleum hydrocarbons belong to a family of organic chemicals called Alkanes. The aerobic biological mechanism of alkane metabolism in both short and long chain hydrocarbons occurs monoterminally to the corresponding alcohol, aldehyde and monobasic fatty acid. The primary alcohol derived from alkane is oxidized to the corresponding aldehyde by alcohol dehydrogenase, and the aldehyde is oxidized to a fatty acid by aldehyde dehydrogenase. The end by-products of these reactions are fatty acids, carbon dioxide, and water.

PATHWAY OF ALKANE OXIDATION

$H_3C\text{-}(CH_2)_n\text{-}CH_3$

O_2

$H_3C\text{-}(CH_2)_n\text{-}CH_2OH$
(Primary Fatty Alcohol)

*Note: From this point the process can proceed anaerobically

$H_3C\text{-}(CH_2)_n\text{-}CHO$
(Fatty Aldehyde)

$H_3C\text{-}(CH_2)_n\text{-}COOH$
(Monocarboxylic Fatty Acid)

O_2

$HOH_2C\text{-}(CH_2)_n\text{-}COOH$
(Hydroxy Fatty Acid)

$HOOC\text{-}(CH_2)_n\text{-}COOH$
(Dicarboxylic Fatty Acid)

WHY BIOREMEDIATE?

Soils contaminated with hydrocarbons may be disposed of or treated in several ways: regulated permitted landfills, thermal incineration and bioremediation. The latter is a method that treats the soils and renders them non-hazardous, thus eliminating any future liability that may result from landfill problems or violations.

Landfill disposal costs range from $34 per yard to over $200 per yard depending on hydrocarbon concentration. Thermal incineration costs range from $60 to over $100 per yard. Bioremediation costs range from $20 to $40 per yard. Bioremediation can be done on site or at a bioremediation facility.

Micro-TES, Inc.
For All Your Bioremediation Needs

May 18, 1995

TO: David Newman, CCC Group

RE: VOC air emissions using the Royer Shredder Bioremediation System

Dear Mr. Newman,

It has been our experience that bioremediation of soils using the Royer Shredder in combination with it's custom spray bar system emits little or no VOC's into the atmosphere. This has been verified using both photoionization detectors (PID), and catalytic detectors (Gas Tech).

The reasons vary, but it is our opinion that VOC's tend to adsorb to clays present in most soils thus reducing their ability to vaporize. In addition, wetting or dampening the soils prior to introduction into the shredder causes slight solubilization of VOC's. The Royer itself is equipped with a spray bar system that inoculates the shredded soil as it comes off the conveyor belt, thus further wetting the soil and virtually eliminating VOC emissions.

We at Micro-TES, Inc. as producers of biological products have found that this is one of the best pieces of equipment available for treating VOC/hydrocarbon contaminated soil.

If you have any other questions, please don't hesitate to call me.

Respectfully,

Bill Botto
President

12500 Network, Suite 201, San Antonio, Texas, 78249 (210) 558-4757/FAX (210) 558-4675

US005342146A

United States Patent [19]

Cooper

[11] Patent Number: 5,342,146

[45] Date of Patent: * Aug. 30, 1994

[54] METHOD AND APPARATUS FOR TREATMENT OF CONTAMINATED SOIL PARTICLES

[75] Inventor: George A. Cooper, San Antonio, Tex.

[73] Assignee: Cooper Equipment Company, San Antonio, Tex.

[*] Notice: The portion of the term of this patent subsequent to Aug. 3, 2010 has been disclaimed.

[21] Appl. No.: 121,278

[22] Filed: Sep. 14, 1993

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 2,760, Jan. 12, 1993, Pat. No. 5,271,694.

[51] Int. Cl.[5] B09B 3/00; E02D 3/12

[52] U.S. Cl. 405/128; 405/258

[58] Field of Search 405/258, 128, 129, 263, 405/264; 110/246, 346, 347

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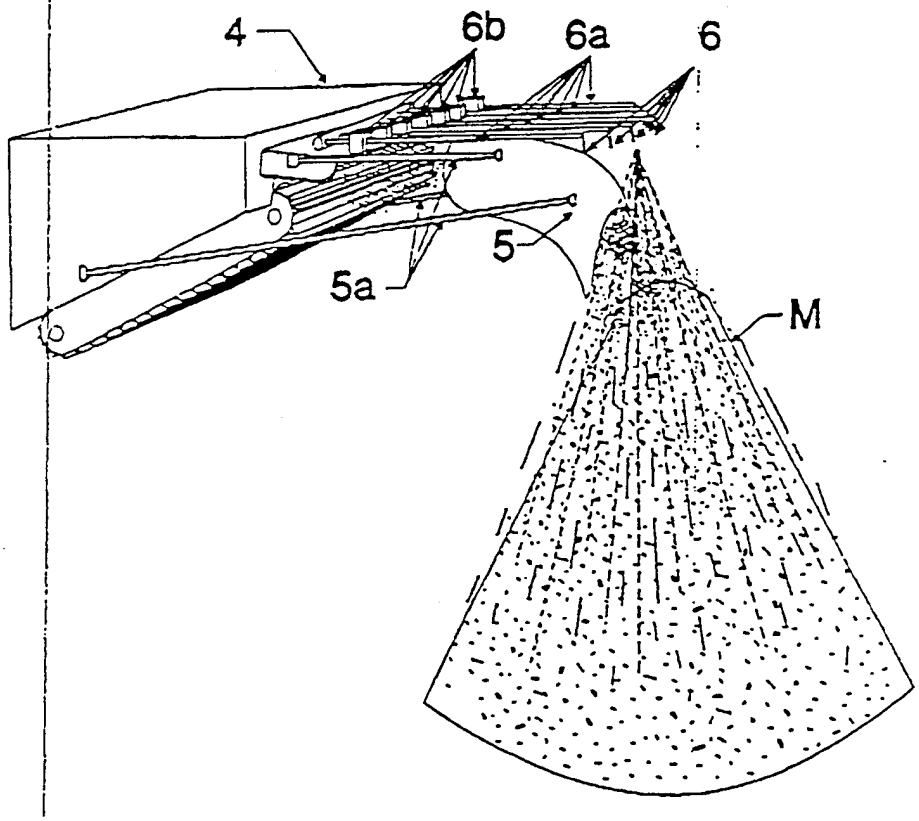
Primary Examiner—Dennis L. Taylor

Attorney, Agent, or Firm—Cox & Smith Incorporated

[57] ABSTRACT

A method and apparatus for decontaminating hydrocarbon contaminated soil particles comprises an upwardly directed conveyor which passes the soil through shredding knives to breakup the soil into a plurality of particles having a preselected maximum size. The stream of particles are directed against a downwardly inclined deflector to be directed downwardly toward a ground or concrete surface to form a growing conical pile of contaminated soil particles. A first set of spray nozzles, located above the particle stream, directs a spray of water containing decontaminating agents into the contaminated soil particle stream generally parallel to and within the stream of the contaminated soil particles, thus moistening the particles and assisting in producing a rolling action of the particles down the sides of the growing conical pile of particles. A second spray is utilized to direct a stream of water containing decontaminating agents against the underside of the stream of soil particles and the two sets of sprays provide a effective water barrier against the release into the atmosphere of aromatic materials carried by the contaminated soil particles.

13 Claims, 11 Drawing Sheets



SITE AIR SURVEILLANCE RECORD

(Honolulu, Hawaii)

OGDEN ENVIRONMENTAL AND ENERGY SERVICES

SITE INFORMATION		Page 3 of 4
PROJECT #: SITE MANAGER: Jeff Cotter	DATE: 5/1/93 H&S COORDINATOR: Cathi Seto	SITE LOCATION: KAPALAMA SOUTH

SITE CONDITIONS

SITE PERSONNEL:

TEMPERATURE: 85 F

RELATIVE HUMIDITY:

WIND SPEED & DIRECTION: SW 5-10 mph

SAMPLE NO.	TIME	SAMPLE DESCRIPTION	LOCATION	INSTRUMENT	READING	COMMENTS
	0918	PERIMETER	15' from Shredder	PID	37.8	NO MIST (sprayer off)
			(downwind)	MR	0.036	
	0923	AREA	1' from Shredded Soil	PID	68.9	NO MIST (sprayer off)
				MR	0.052	
	0927	PERIMETER	15' from Shredded Soil	PID	18.3	w/ MIST (sprayer on)
				MR	0.00	
	0930	AREA	1' from Shreeded Soil	PID	42.6	w/ MIST (sprayer on)
				MR	0.00	
	1156	BACKGROUND	Area	PID	0.0	
				MR	0.1	
	1255	PERSONNEL	Breathing Zone	PID	4.2	
				MR	0.1	

PID - Photo Ionization Detector was Photoval Microtiop II

MR - Dust Monitor was MIE MiniRam Dust Monitor

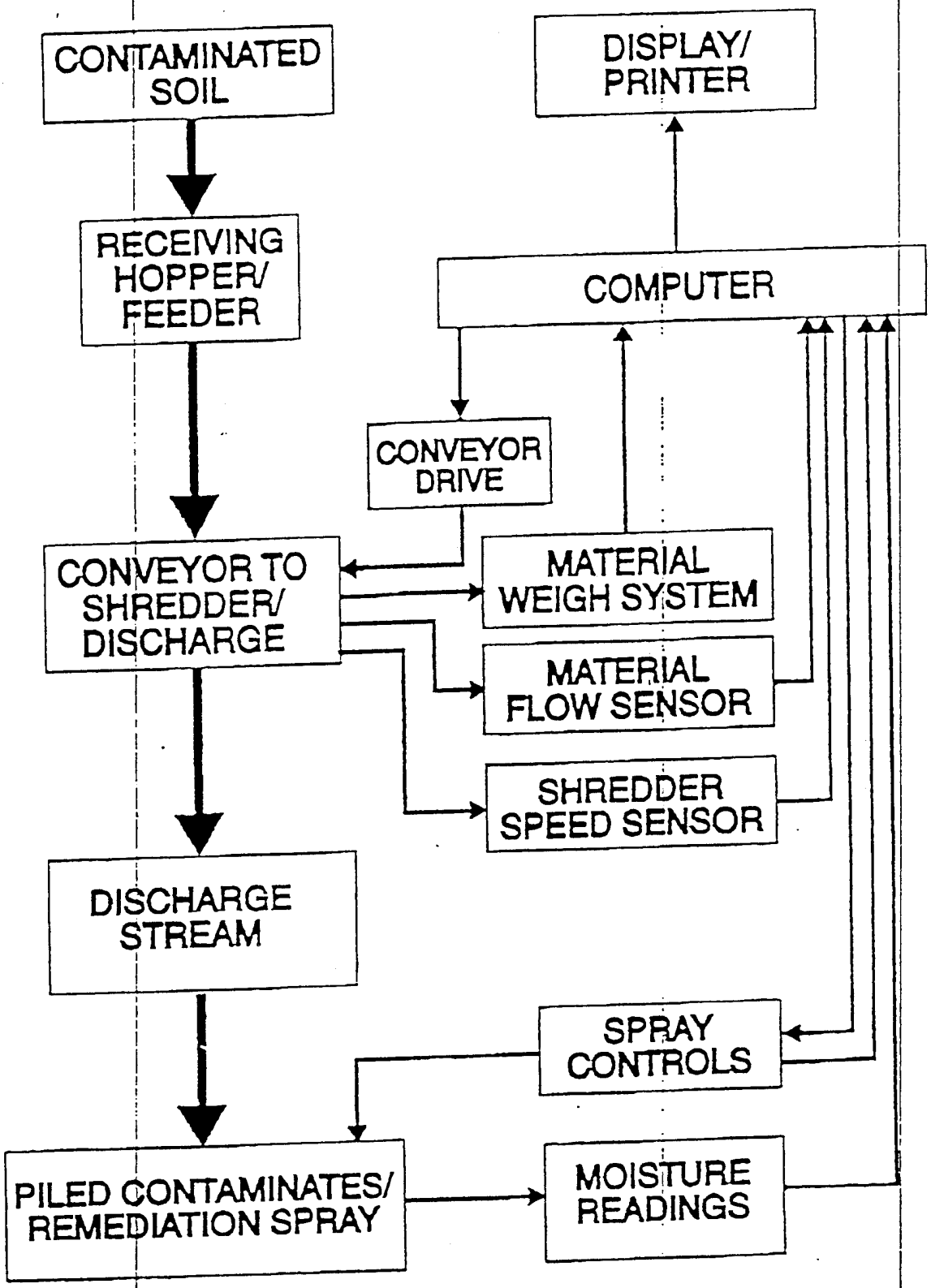

CONTAMINATED SOIL
RECEIVING HOPPER/ FEEDER
CONVEYOR TO SHREDDER/ DISCHARGE
DISCHARGE STREAM
PILED CONTAMINATES/ REMEDIATION SPRAY
DISPLAY/ PRINTER
COMPUTER
CONVEYOR DRIVE
MATERIAL WEIGH SYSTEM
MATERIAL FLOW SENSOR
SHREDDER SPEED SENSOR
SPRAY CONTROLS
MOISTURE READINGS

FIG. 6

G

UNICO'S SAMPLING AND ANALYSIS PLAN/ MEETING MINUTES

G1

UNICO'S SAMPLING AND ANALYSIS PLAN

SAMPLING AND ANALYSES PLAN
MONITORING PLAN

Bioremediation System
Michigan Air National Guard CRTC

* * *

Prepared for:

Michigan Air National Guard CRTC

* * *

Prepared by

Unico Construction Company
San Antonio, Texas
June 1995

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SAMPLING AND ANALYSIS PLAN

This Sampling and Analysis Plan has been developed by Unico Construction Company (Unico) to comply with requirements of the Specifications for the Construction of a Bioremediation System at the Michigan Air National Guard CRTC. This Monitoring plan will enable the contractor to determine the number and location of samples to be taken to assure compliance with Federal, State and local cleanup requirements.

The contractor shall provide and coordinate the services of an environmental chemical laboratory to perform laboratory analyses. This laboratory will operate under the U.S. EPA Contract Laboratory Program. The name and qualifications of the contractor's laboratory will be submitted to the contracting officer per the submittal requirements and the attached submittal register.

Unico considers the previous site investigations adequate to characterize the sites. Therefore, Unico will begin the project by excavating and remediating the soils to the depths and dimensions described in the specifications. Site 2 will be remediated in-situ for TPH and lead per our work plan. Site 4 will be excavated and remediated ex-situ for benzene, napthalene, and methylnapthalene per our work plan. After Site 4 is excavated to the specified dimensions, and Site 2 is remediated, samples will be collected and analyzed for the particular contaminates of concern to verify all of the contaminated soil is removed and/or remediated. These samples will be referred to as the Site Confirmational Samples.

After the soil is treated and adequate time has elapsed to allow the bioremediation, Stockpile Confirmational Samples will be collected and analyzed. These samples will be collected and analyzed for the particular contaminates of concern and will serve to substantiate the completed bioremediation project.

Monitoring

Field screening will be used to determine when the bioremediation is complete and when confirmation samples can be obtained. Additionally, the field screening will be used to monitor worker safety. The field screening will include using a Photoionization Detector (PID), laboratory analyses, and field screening kits. Field screening can be performed anytime, at the discretion of the site superintendent. The PID will be used in the breathing zone to monitor worker safety. The PID will also be used to detect head-space concentrations of volatile hydrocarbons.

Site 2 Monitoring

Site 2 consists of a TPH and lead-contaminated drainage ditch. The TPH and lead were detected at concentrations as high as 460 ppm and 48 ppm, respectively. We propose to bioremediate the soil and stabilize the lead in-situ. Pending our field screening results, we will sample and analyze the soil at the following rates to confirm TPH remediation and lead stabilization:

SAMPLE DESCRIPTION	NO. OF SAMPLES	TOTAL SAMPLES	CONTAMINATE	EPA METHOD	*CLEAN UP CRITERIA
TPH Site Confirmational Samples	1 per 25 lf	6	Semi-volatile scan	Method 8270/625	Type B Standards
**Lead Site Confirmational Samples	1 per 50 lf	8	lead	SPLP or TCLP Lead 1311/7421	4 ppb
QA/QC Samples (duplicate)	1 per 12 samples	1	lead or Semi-volatile	Method 8270/625 or 1311/7421	

*New regulations concerning cleanup criteria are expected to be signed into law on June 2, 1995. Unico expects the new cleanup standards to be less restrictive than the criteria listed in this plan. Unico also expects to achieve the cleanup levels outlined in this plan. However, per the June 1, 1995, meeting between the ANG, Unico, Montgomery-Watson, and the MDNR, the less restrictive cleanup criteria that are expected to be signed into law on June 2, 1995, will be acceptable for this project.

**Page 3-2 of the Specifications indicate that a TCLP analysis might show that no leachate concentrations above the Type B cleanup criteria exist at Site 2. Per our proposal, we anticipated that the bioremediation process would further reduce the leachate concentrations, possibly below the cleanup levels. Per our work plan, we will apply the microbes to Site 2. Per the June 1, 1995 meeting, we will sample and analyze for total lead. It is anticipated that these total lead concentrations will be below the June 2, 1995 cleanup criteria. If the total lead is below the cleanup criteria, then the leachate analyses (SPLP or TCLP) will not be necessary and will not be performed. Eight soil samples will be collected and analyzed for total lead.

Previous investigations indicate Site 2 is contaminated with total lead ranging 0.84 to 48 ppm. Based on information obtained from the MDNR, the type B cleanup criteria for lead with total concentrations between 21 ppm and 400 ppm is 4 ppb TCLP or SPLP.

The concentration of lead in the soils at Site 2 appears to be relatively homogeneous. The soils at Site 2 also appear to be homogeneous. The total quantity of soil to be stabilized for lead is 319 cy. One sample per 50 lf equals eight samples, or one sample per every 40 cy.

Site 4 Monitoring

Site 4 consists of three areas to be excavated and remediated for benzene, methylnapthalene, and napthalene. These areas include the Fire Training Area (FTA), Pipeline, and gully. Also, approximately 71-cy of concrete and brick will be removed and disposed of at the BFI landfill in Alpena, Michigan. Approximately 48-cy of concrete may be considered special waste. The disposal of this concrete will be based upon sampling and analysis required by BFI. The remaining concrete and brick is considered construction debris.

The FTA is makes up approximately 96% of the soil to be remediated. It is contaminated with benzene, methylnapthalene, and napthalene in concentrations as high as 300 ppb, 26000 ppb, and 11000 ppb, respectively. It is a cylindrical volume of soil approximately 18,000 cy.

The Pipeline extends from the FTA approximately 200-ft to a control block. After removal of the control block and the FTA the remaining soil 20-ft deep and 5-ft wide between the excavations will be excavated. The excavation of the FTA will more likely than not incorporate the pipeline. The gully will be excavated to a depth of 1-ft as a precautionary measure only. It is assumed to be non-contaminated.

The soil from the FTA, Pipeline, and gully will be excavated and bioremediated per our work plan. Site Confirmation Samples will be obtained from the floor and sidewalls of the excavation to verify site clean up. Stockpile samples will be obtained from the bioremediation stockpiles to verify remediation of the stockpiled soil according to Michigan Department of Natural Resources (MDNR) standards. Approximately 80 stockpiles will be generated from this bioremediation effort. The sampling frequency and clean up level are as follows:

SAMPLE DESCRIPTION	NO. OF SAMPLES	TOTAL SAMPLES	CONTAMINATE	EPA METHOD	CLEAN UP CRITERIA
FTA Site Confirmation Samples	4 floor, 8 sidewall	12	Benzene Methylnapthalene Napthalene	Method 8020 or 8260 Method 8270 Method 8270	24 ppb 33 ppb 5 ppm
Pipeline Site Confirmational Samples	1 floor, 2 sidewall	3*	Benzene Methylnapthalene Napthalene	Method 8020 or 8260 Method 8270 Method 88270	24 ppb 33 ppb 5 ppm
Stockpile Confirmation Samples	1 per stockpile	80	Benzene Methylnapthalene Napthalene	Method 8020 or 8260 Method 8270 Method 8270	24 ppb 33 ppb 5 ppm
QA/QC Samples (duplicate)	1 floor 5 stockpile	5	Benzene Methylnapthalene Napthalene	Method 8020 or 8260 Method 8270 Method 8270	24 ppb 33 ppb 5 ppm

* The number of samples to be collected and analyzed will be dependent on the extent of the FTA excavation. Actual field conditions may reduce or increase the number of samples to collect and analyze.

The clean up criteria are based on MDNR Type B default values and the specifications. The analytical test methods are from U.S. EPA SW846.

Sampling Procedures

A grid type sampling scheme based on the U.S. Environmental Protection Agency (EPA) Manual for Evaluating Solid Waste (SW846) will be used to identify Site Confirmation sampling locations. The Site Confirmation Samples will be collected at the ground surface. The Stockpile Confirmational Samples will be collected at a rate of one per stockpile. It is estimated that 80 stockpiles will be generated. The Stockpile Confirmational Samples will be collected from the center of each stockpile. Modifications to this sampling scheme by the site superintendent may be permitted based on actual field conditions.

Personnel and Data Logging

Samples are to be taken by qualified personnel only. Personnel shall have documentable experience collecting hazardous waste samples and shall meet all health requirements for this type of work. Sampling personnel shall be under the direct control of the chemical laboratory. Field sampling data shall be recorded in a bound log book consisting to the following:

- Date and time of sampling
- Sample identification (Alphanumeric)
- Sample location description (Sketch)
- Depth of sample
- Observations (Staining, odor, groundwater)
- Weather conditions (Temperature, wind, clouds, precipitation)
- Printed name of sampling personnel

Soil Samples

Site Confirmational Samples shall be taken at the ground surface. Stockpile Confirmational Samples will be collected from the middle of each conical shaped stockpile. All Stockpile Samples will be collected using a pre-cleaned ferrous metal shovel, ferrous metal hand trowel, or other suitable device. A backhoe bucket may also be used. Site Confirmation Samples shall be collected from the backhoe bucket only. Personnel will not be permitted to enter the excavations to collect Site Confirmation samples. Samples collected from the backhoe bucket will be taken from the center of the bucket to avoid cross-contamination with the sides. The top lip of the sample container shall be wiped free of residual sample prior to installing the threaded closure. The blade of the digging implement shall be cleaned immediately prior to use with a laboratory-grade detergent solution, followed by thorough rinses with distilled or deionized water. The implement shall be dried with a lint-free paper towel prior to use.

Sample Containers and Preservation

The samples will be collected in 8-oz wide-mouth glass jars. Sample containers will be full with little head space. Lids will be Teflon-lined. Samples will be placed on ice and transported to the laboratory for analyses. Sample containers shall be pre-cleaned according to EPA/SW.846 specifications, and may be purchased commercially from I-Chem, Eagle Pitcher, or other equivalent source. Each sample container shall be clearly identified with the field sample number, date, and time of sampling, and the name of the sampling personnel. Field information shall be written in indelible ink and the label shall be affixed in such a manner to ensure it does not become separated from its respective container.

Properly labeled sample containers shall be placed in zip-lock bags and stored in an iced picnic cooler during sampling operations. Following the conclusion of sampling operations on any given day, samples will be shipped directly to the appropriate laboratories. Samples must be received at the appropriate laboratories within five days of collection. Samples shall be maintained in a refrigerated condition at all times, including during transportation.

G2

MEETING MINUTES

Meeting Minutes
June 1, 1995
MDNR District Office
Gaylord, Michigan

Meeting Attendees:

John Alford	Michigan Department of Natural Resources
Andy Stempke	Michigan Department of Natural Resources
Captain Fred Kimble	Air National Guard (Alpena CRTC)
Dave Newman	Unico/CCC Group
Ben McGeachy	Montgomery Watson

Meeting Minutes:

These minutes document the June 1, 1995 meeting held to discuss Unico's proposed *Sampling and Analysis Plan* (Unico, April 1995) for the bioremediation project at Sites #2 and #4 of the Alpena Combat Readiness Training Center in Alpena, Michigan. The meeting was held at the Michigan Department of Natural Resources (MDNR) District Office in Gaylord, Michigan and was attended by representatives of the MDNR, Air National Guard, Unico/CCC Group (Unico), and Montgomery Watson. Issues discussed at the meeting included:

Site #2:

- Dave Newman proposed that confirmatory samples collected from Site #2 be analyzed for total petroleum hydrocarbons (TPH). Confirmatory samples would include samples collected to confirm the limits of excavation as well as samples collected from the stockpile(s) following bioremediation. John Alford stated that analyzing for TPH is not acceptable to the MDNR for confirmatory sampling. John Alford stated that confirmatory samples should be analyzed for semi-volatile organic compounds (SVOCs).
- A discussion was held concerning how new legislation (i.e., Michigan Public Act 451) may effect the bioremediation project. John Alford and Andy Stempke stated that Michigan Public Act 451 is scheduled to be signed into law on June 2, 1995 and that the Act will take immediate effect. The MDNR will be issuing revised clean up criteria for contaminants such as SVOCs and lead that may effect the bioremediation project. It is anticipated that the revised clean up criteria will be less stringent than previous clean up criteria.
- Andy Stempke stated that the need for remediation of SVOCs at Site #2 cannot be determined from TPH concentrations. Andy Stempke suggested that a soil sample be collected from the area with the highest known TPH concentration and analyzed for SVOCs. Analytical results from this sample should be compared to revised clean up levels to determine the need for remediation.

- Andy Stempke stated it is likely that the revised clean up criteria will not require remediation of lead at Site #2 (the highest known lead concentration at Site #2 is 48 parts per million).

Site #4:

- Dave Newman asked for a clarification of the clean up criteria for methylnapthalene. Andy Stempke stated that a clean up level for methylnapthalene has not been determined and therefore the clean up level defaults to background level. Andy Stempke indicated that 330 parts per billion is an acceptable method detection limit for methylnapthalene.
- Andy Stempke and Dave Newman discussed the sampling frequency for bioremediated soil. Andy Stempke stated that the bioremediated soil should be sampled at a minimum frequency of 1 sample per 200 cubic yards of bioremedated soil. Andy Stempke stated that additional samples may be required if the confirmatory sample for a stockpile of bioremediated soil failed to meet clean up levels.

General:

- John Alford and Andy Stempke stated that although parts of Unico's proposed *Sampling and Analysis Plan* do not conform to the MDNR's *Verification of Soil Remediation Guidance Document*, the plan (with the exceptions noted above) is acceptable to the MDNR. John Alford and Andy Stempke stated that MDNR's *Verification of Soil Remediation Guidance Document* is intended as a guide and that MDNR personnel may approve alternative sampling plans.
- Captain Kimble stated that he would notify Andy Stempke when Unico had their bioremediation equipment operating so that Andy Stempke could inspect the process.

Minutes Distribution:

John Alford	Michigan Department of Natural Resources
Andy Stempke	Michigan Department of Natural Resources
Captain Fred Kimble	Air National Guard (Alpena CRTC)
Paul Wheeler	ANGRC/CEVR
Dave Newman	Unico/CCC Group
Doug Barber	Montgomery Watson
Ben McGeachy	Montgomery Watson